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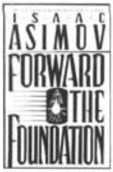
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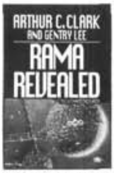
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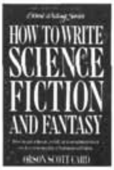
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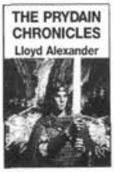
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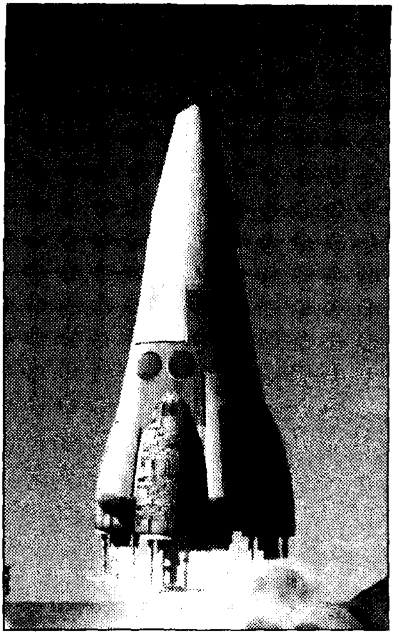

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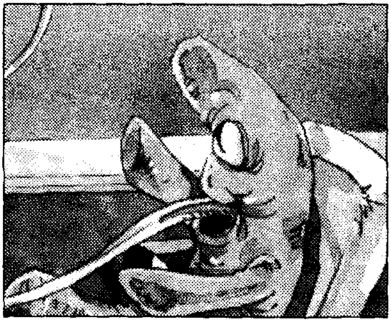

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## EDITORIAL Stanley Schmidt

# THE AGE OF THE PUSSYFOOT

I must apologize to Frederik Pohl for borrowing his title (in return I'll urge you to read all his books, including *The Age of the Pussyfoot*), but I couldn't think of another that so aptly characterized the current state of American society.

What started my thoughts on this train was a Mike Royko column last October, which ran in my local paper under the heading, "Will Your Goblins Be Politically Correct?" His subject was a letter which has been sent to parents before Halloween for the last several years by an "Equity-Affirmative Action Advisory Committee" for a school system in Iowa. The letter doesn't establish an enforceable policy, but it does advise parents to be "sensitive to all ethnic and racial group members and other special group members such as the elderly and the disabled when choosing costumes." As a means to this end, it lists several specific types of costumes to be avoided because they might offend somebody, including, "Gypsy, American Indian, African, witch, old man, differently abled person, East Indian, slave, hobo, devil, old woman."

Whew!

That eliminates a *lot* of possibilities—and for what? Yes, these days I can well believe that somebody might take offense at any of those—or just about anything else. But is that sufficient reason to avoid them? Why should the wearing of a costume necessarily be construed as an insult? I confess to the dark sin of having worn some of those Terrible Things myself, in my Halloweening days, and I find the suggestion that I did so to insult somebody as idiotic now as I would have then. It was a simple matter of recognizing that there are a lot of different kinds of people in the world, and it was fun to pretend for a few hours each year to be one of them. There was nothing more or less to it than that, and I daresay that's still the case. The fact that somebody chooses to attribute a sinister motive to you does *not* mean that you actually have one, or should feel any obligation to act as if you did.

Even if some kids do wear their costumes with a sneer, is *that* enough reason to try to pressure everybody into avoiding them? No, I'm *not* saying it's all right to make fun of ethnic or other affinity groups, or that anyone should be encouraged to do so. On the other hand, I don't think it does much for the strength of either a society or its members to teach some of them that they must tread ever so lightly with every word and gesture lest they offend somebody, and to teach others that they should expect everyone else to handle their feelings with kid gloves. Certainly we all need to learn to respect all sorts of other people—but we also need to develop the personal strength not to be too easily offended or intimidated, or to attach too much significance to other people's opinions.

And we very much need to recognize and accept who we are, without fear or apology, and without the emotional need to hide behind euphemisms. Blind is blind, as several blind friends of mine cheerfully and matter-of-factly acknowledge, and calling it "visually impaired" doesn't change it. It's far better to face facts, accept them as such, and deal with them, than to pretend that calling them something else changes what they are. We've always had euphemisms, but lately they've gotten out of hand. Of course, few of us admit that, either. We now have a euphemism for euphemism itself—but calling it "political correctness" doesn't change what it is. (As I recall, when I first heard that term, it carried an undertone of ridicule—"politically correct" meant things that people said because they had to get re-elected. Maybe we should bring some of that back. . . .)

There's another angle on this business of costumes-as-insults that doesn't seem to have occurred to the Iowa committee. They choose to assume that a gypsy, American Indian, or African costume is automatically derogatory and demeaning. I can easily imagine a proud gypsy, American Indian, or African interpreting this as the committee's belief that those are actually inferior things to be—that a gypsy or an African is not a worthy thing for someone to want to be for an evening. I can imagine such a person finding *that* view insulting—just

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as I can imagine someone dressing up as a Zulu or a Sioux because he or she *admires* that culture.

Such considerations remind me of a dilemma that bothered a friend of mine some years ago. Was it really right, he wondered, for *National Geographic* to publish pictures of people in "primitive" cultures in clothing (or lack thereof) that would not be considered acceptable for "our own" people in the same magazine? Didn't showing them in attire that our culture doesn't consider suitable for public display show a lack of respect for them as people? My reply was an emphatic "No, it does not; and yes, they should be portrayed as they actually dress." To edit their pictures on the basis of *our* culture's standards would imply that we had no respect for *their* standards—and that *would* be insulting.

An exaggerated emphasis on avoiding offense through word or costume is not, of course, by any means the only way our current culture has made pussyfooting a way of life. Our local newspaper has recently taken to running restaurant reviews *without ratings*. The reviews used to include a sidebar containing, among other things, a cluster of zero to five stars, giving the reviewer's overall judgment of a place. Now that space is conspicuously blank. When I called the editor to point out that this made the reviews nearly useless, and to inquire about the rationale for such a bizarre change, I was told that the editors thought this would be "better." It would force people to actually

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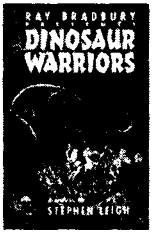

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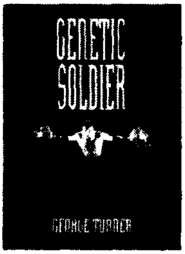

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read the column instead of just making a snap judgment from a glance at the stars—which, after all, "are just one person's opinion."

Well, of course they are—but so is the whole review. Most of us are intelligent enough to recognize that—but we want to know what that one person's opinion *is*. Dropping the ratings is a way to evade the responsibility (which is what the reviewer is paid for) of expressing one. The editor is certainly right that the lack of a rating forces you to read the whole column, if you want to have any hope of getting any useful information. You may even succeed in doing so, if the comments are *all* glowing or all harsh; but that's seldom the case. A more typical review is a mixture of plusses and minuses, and it's easy to reach the end wondering, "OK, did he like it or not?" The rating answers that question—or would, if the editors still had the gumption to print it. Just between you and me, I suspect the *real* reason they've dropped the ratings is that they're afraid of hurting some restaurateur's feelings (and losing his advertising dollars).

In other words, more pussyfooting.

Want more? Consider the current epidemic of child abuse, sexual harassment, and date rape charges. Some of them are undoubtedly real, serious, and deserve diligent prosecution. I am *not* by any means suggesting that child abuse, sexual harassment, and date rape are OK. If you're about to attack me for doing so, I suggest you save your paper and instead spend your time trying to understand what I'm *really* saying. I'm saying that such charges are now often brought on such flimsy pretexts that people who would never dream of *really* doing those things have become afraid to discipline their children in any way, or to make even simple, natural, innocuous gestures of affection.

Hm-m-m . . . is this the explanation of the Fermi Paradox? Have all the advanced races become so afraid of sexual harassment suits that nobody was willing to get close enough to a member of the opposite sex to take even preliminary steps toward procreation? That would certainly keep them from getting any *more* advanced. . . .

Or consider the current mania for testing the daylights out of things, such as drugs, before using them—the phenomenon sometimes known as "analysis paralysis." Naturally it's wise to do a reasonable amount of testing before rushing into a course of action—but it's also wise to recognize when continued delay is costing more than it's likely to save.

Back in the forties and early fifties, poliomyelitis was a greatly feared disease in this country, for the very good reason that it killed or crippled thousands of people every year. In 1952 Jonas Salk had a vaccine sufficiently developed to begin testing on humans; three years later it was being widely used. What are the chances that an AIDS vaccine developed now could get into general use that fast? Slim, I'd say. These days the FDA would rather try to remove the last smidgeon of doubt that the lab rats are safe before using something new

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on humans, and would rather not be bothered with the embarrassing question of how many humans die unnecessarily while they wait. Examples abound of drugs being widely and successfully used in Europe long before they're approved for any use in this country.

Yes, you may say, but caution is *needed.* Remember that when the Salk vaccine was rushed into use, the haste led to some being prepared without sufficient care and some 200 cases of polio, and 11 deaths, were actually caused by vaccine injections. True enough; but the vast majority of the inoculations did *not* have such effects, almost certainly prevented far more cases than they caused, and taught people how to avoid those problems in the future. If those statements are true, then *even with* the 200 vaccine-caused cases and 11 deaths, introducing the vaccine at that time did far more good than harm.

Marc Stiegler recently suggested an interesting criterion for evaluating, with hindsight, the relative costs of haste and caution. Consider any one of those drugs that helps Europeans before it's allowed to help Americans. When the FDA finally approves it, the newspapers are sure to be full of figures for How Many Lives Will Be Saved Per Year. Multiply that figure by the number of years the drug was available elsewhere but not here, and you get the number of people who were killed by official "prudence."

Up to a point, caution about physical risk is a survival trait. Carried too far, it defeats its own purpose. If you're not sure you can jump a four-foot crevasse, it makes sense not to try if you don't have to. It does *not* make sense if that's your only hope of getting away from a rapidly spreading brushfire.

Up to a point, it's a mark of civilization to be respectful and considerate of all kinds of other people. But it does no one any favors to make everyone else afraid to mention some group lest its members be offended, or to encourage that group to act mortally wounded if someone mentions them in a way they don't like. A far more useful approach would be to teach everyone respect for others *and* enough self-respect to build good lives for themselves despite misguided opposition from slow learners.

To put it bluntly: how much can we accomplish if we're so afraid of offending somebody, making a mistake, or being sued that we're afraid to *do* anything?

I think we're overdue for a reminder of a simple truth that John W. Campbell often quoted. "Behold the tortoise: he maketh no progress unless he sticketh out his neck!" ■

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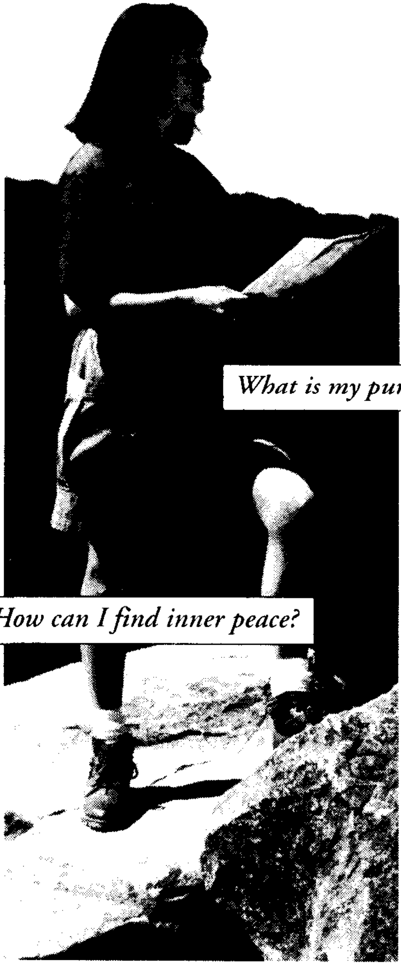

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Ben Bova

# SAM'S WAR

*Opening up new kinds of territory will naturally open up new kinds of territorial disputes. . . .*

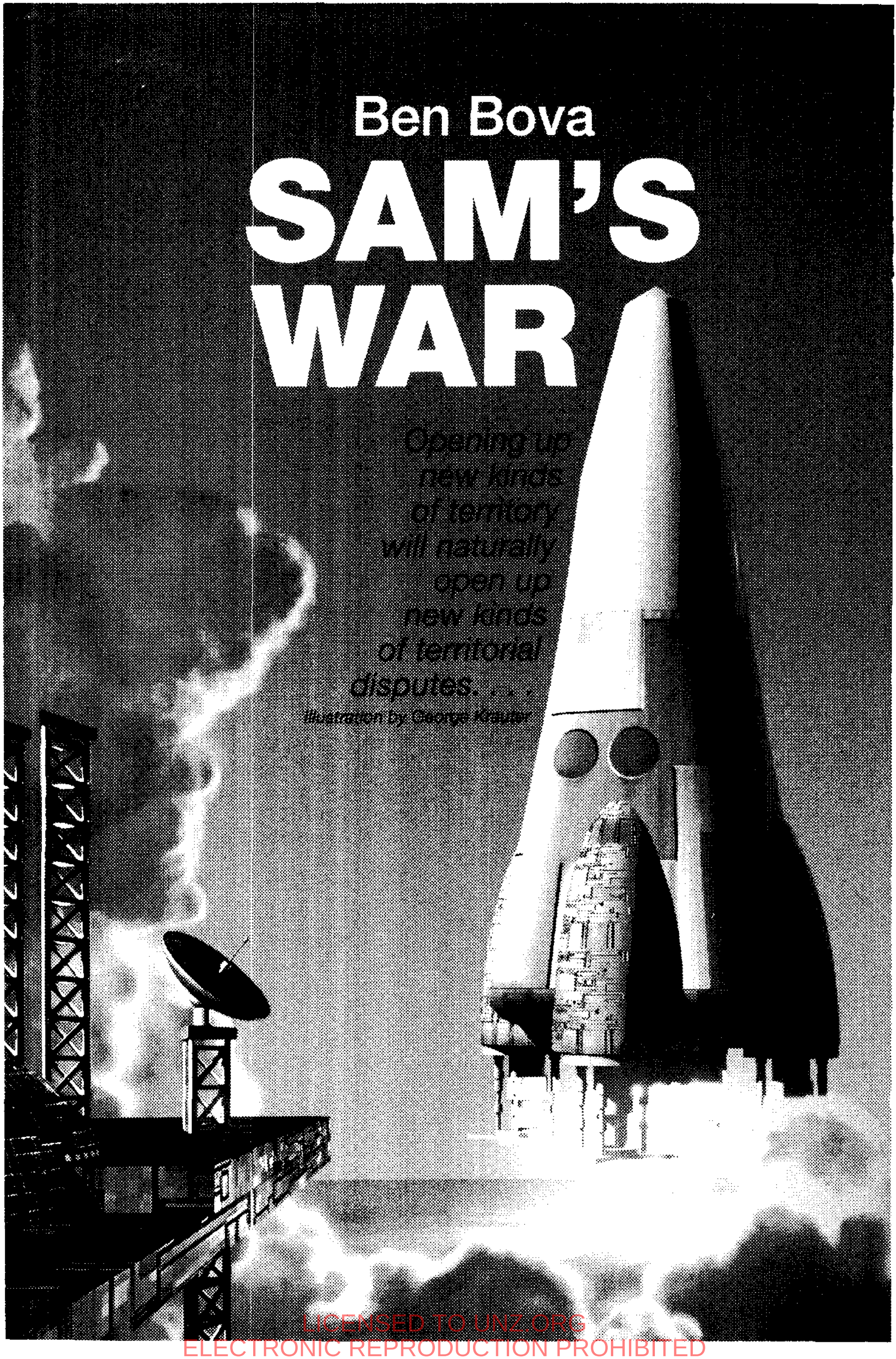

*Illustration by George Krauter*

I know it is incredible to believe that Sam Gunn, of all people, saved civilization-as-we-know-it. But the chauvinistic little Gringo did. Although he never got the credit for it.

Yet he was lucky, at that. After all, I was supposed to murder him.

Not that I am a professional assassin, you understand. The daughter of *el Presidente* is no common thug. I followed a higher calling: national honor, patriotism, love of my people and my father. Especially, love of my father.

Ecuador was, and still is, a democracy. My beloved father was, but sadly is no longer, its *presidente.* Above all else, you must realize that Ecuador was, and always had been, among the poorest nations of the Earth.

Ah, but we owned something of inestimable value. Or at least, we owned a part of it. Or at the very least, we claimed ownership of a part of it.

The equator. It runs across our noble country. Our nation's very name is equatorial. An imaginary line, you say. Not entirely imaginary. For above the equator, some thirty-five thousand kilometers above it, lies the only region of space where satellites may be placed in stationary orbits. The space people call it the *geostationary orbit,* or GEO.

A satellite in GEO rotates around the Earth in precisely the same twenty-three hours, fifty-six minutes and few odd seconds that the Earth itself takes to turn one revolution. Thus a satellite in GEO will appear to hover over one spot above the equator. Communications satellites are placed in GEO so that antennas on the ground can lock onto them easily. They do not wander around the sky, as satellites at lower or higher altitudes do.

It was my father's genius to understand the value of the equator. It was also his sad destiny to have Sam Gunn as his nemesis.

"The Gringos and the Europeans get rich with their satellites," father told the other eleven delegations at the meeting.

"And the Japanese, too," said the representative from Zaire.

"Exactly so."

As host to this meeting of the Twelve Equatorial Nations, my father stood at the head of the long polished conference table and gave the opening speech. He was a majestic figure in the captain-general's uniform of sky blue that he had chosen to wear. With the lifts in his gleaming boots he looked almost tall. The uniform tunic's shoulders were broad and sturdy, the medals gleaming on its breast looked impressive even though they were decorations he had awarded himself. He had long been darkening his hair, but now it was thinning noticeably. He had brought in specialists from North America, from Europe and even China; there was nothing they could recommend except an operation to replace his disappearing hair. My father was brave in many ways, but the thought of personal pain made him hesitate.

So he stood before the other delegates with a receding hairline. I thought his high forehead made him look more handsome, more intellectual. Yet he longed for the full leonine mane of his younger days.

My father had spent the better part of two years working, pleading, cajoling to bring these twelve together. They had come reluctantly, grudgingly, I thought. But they had come. There was much to gain if we could capture the geostationary orbit for ourselves.

I served my father as his personal secretary, so I sat against the wall to one side of his imposing figure, together with the other secretaries and aides and bodyguards. The delegates were of all hues and sizes: the massive Ugandan so dark his skin seemed almost to shine; the Brazilian dapper and dainty in his white silk suit; the silver-haired representative from Kiribati dressed in the colorful robes of his Pacific atolls. One could say that these twelve truly represented the entire human race in all its variety, except for the fact that they were all male. I was the only woman present. Not even one of the other aides was a woman.

Although Ecuador was a poor nation, my father had spared no expense for this conference. The table was sumptuously set with decanters of wine and stronger spirits, trays of Caspian caviar and Argentine beef. The people may be poor, my father often said, but the *presidente* must rise above their shortcomings. After all, what are taxes for? The miserable revolutionaries in the mountains vowed to put an end to my father's displays of wealth, and the sour-faced journalists in the cities coined slogans against him, but the people accepted their *presidente* as they always have accepted the forces of nature over which they have no control.

My father thundered on, his powerful voice making the wines vibrate in their crystal decanters. "The corporations of the northern hemisphere use *our* territory and give us nothing for it. Imperialism! That's what it is, nothing but naked imperialism!"

The representatives applauded his words. They were stirred, I could see. They all agreed with my father, each and every one of them. The rich and powerful corporations had taken something that we wanted for ourselves.

But the Indonesian, slim and dark, with the big soulful eyes of a frightened child, waited until the applause ended and then asked softly, "But what can we do about it? We have tried appeals to the United Nations and they have done nothing for us."

"We have a legal right to the equatorial orbit," insisted the Kenyan, preaching to the choir. "Our territorial rights are being violated."

The Brazilian shook his head. "Territorial rights end at the edge of the atmosphere." The Brazilians had their own space operations running, although they claimed they were not making any profits from it. Rumor had it that key members of their government were siphoning the money into their own pockets.

"They most certainly do not!" my father snapped. "Territorial rights extend to infinity."

Two-thirds of the men around the table were lawyers and they immediately fell to arguing. I knew the legal situation as well as any of them. Historically, a nation's territorial rights extended from its boundaries out to infinity. But such legal rights became a shambles once satellites began orbiting the Earth.

The Russians started it all back in 1957 with their original Sputnik, which sailed over virtually every nation on Earth without obtaining prior permission from any of them. No one could shoot down that first satellite, so it established the *de facto* precedent. But now things were different; anti-satellite weapons existed. True, the big nations refused to sell them to their smaller neighbors. But such weapons were built by corporations, and there were ways to get what one wanted from the corporations—for money.

My father's strong voice cut through the babble of argument. "To hell with the legalities!"

That stunned them all into silence.

"When a nation's vital interests are being usurped by foreigners, when a nation's legal rights are being trampled under the heels of imperialists, when a nation's wealth is being stolen from its people and their chosen leaders—then that nation must fight back with any and every means at its disposal."

The Indonesian paled. "You are speaking of war."

"Exactly so!"

"War?" echoed the Ugandan, dropping the finger sandwich he had been nibbling.

"We have no other course," my father insisted.

"But . . . war?" squeaked the slim and timid representative from the Maldives. "Against the United States? Europe? Japan?"

My father smiled grimly. "No. Not against any nation. We must make war against the corporations that are operating in space."

The Brazilian ran a fingertip across his pencil-thin moustache. "It should be possible to destroy a few satellites with ASATs." He was showing that he knew not only the political and military situation, but the technical jargon, as well.

"Fire off a single anti-satellite weapon and the U.N. peacekeepers will swoop down on you like avenging angels," warned the delegate from Gabon.

"The same U.N. that refuses to consider our request for justice," my father grumbled.

The Colombian representative smiled knowingly. "There are many ways to make war," he said. "Space facilities are extremely fragile. A few well-placed bombs, they can be very small, actually. A few very public assassinations. It can all be blamed on the Muslims or the ecologists."

"Or the feminists," snapped the Indonesian, himself a Muslim and a devoted ecologist. Everyone else in the room laughed.

"Exactly so," said my father. "We pick one corporation and bend it to our will. Then the others will follow."

Thus we went to war against Sam Gunn.

My father was no fool. Making war—even the limited kind of terrorist's war—against one of the giant multinational corporations would

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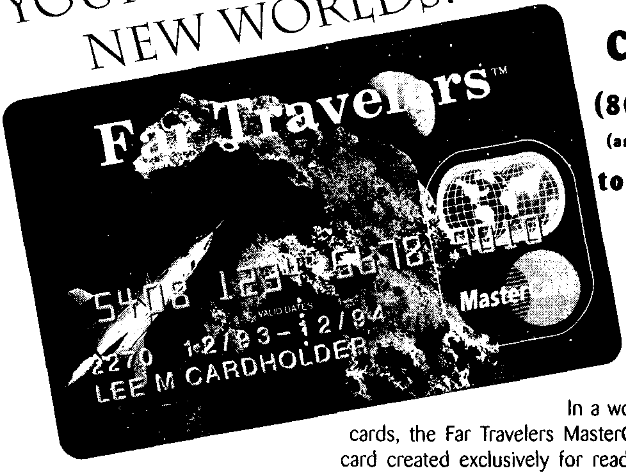

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have been dangerous, even suicidal. After all, a corporation such as Rockledge International had an operating budget larger than the Gross National Product of most of the Twelve Nations. Their corporate security forces outgunned most of our armies.

But Sam Gunn's corporation, VCI, was small and vulnerable. It looked like a good place to start.

So our meeting ended with unanimous agreement. The Twelve Equatorial Nations issued the Declaration of Quito, proclaiming that the space over the equator was our sovereign territory, and we intended to defend it against foreign invaders just as we would defend the sacred soil of our homelands.

The Declaration was received with nearly hysterical fervor all through Latin America. In Ecuador, even the revolutionaries and the news media reluctantly praised my father for his boldness. North of the Rio Grande, however, it was ignored by the media, the government, and the people. Europe and Japan received it with similar iciness.

My far-seeing father had expected nothing more. A week after the meeting of the twelve he told me over dinner, "The Gringos choose to ignore us. Like ostriches, they believe that if they pay us no attention we will go away."

"What will be your next move, Papa?" I asked.

He smiled a fatherly smile at me. "Not my move, Juanita, my beautiful one. The next move will be yours."

I was stunned. Flattered. And a bit frightened.

My father had chosen me for the crucial task of infiltrating VCI. I had been educated at UCLA and held a degree in computer programming, despite my father's grumbling that a daughter should study more feminine subjects, such as nutrition (by which he meant cooking). I also had a burning fervor to help my people. Now I received a rapid course in espionage and sabotage from no less than the director of our secret police himself.

"You must be very careful," my father told me, once my training was concluded.

"I will be, Papa," I said. I had joined him for breakfast on the veranda of the summer palace, up in the foothills where the air was clean and deliciously cool.

He looked deep into my eyes, and his own eyes misted over. "To send my only child to war is not an easy thing, you know." He was being slightly inaccurate. I was his only legitimate child, and it was obvious that he had been planning to use me this way for some time.

"Yet," he went on, "I must *think* and act as *el Presidente*, rather than as a loving father."

"I understand, Papa."

"You will be a heroine for your people. A new Mata Hari."

The original Mata Hari had been a slut and so poor at espionage that she was caught and executed. I realized that my father did not know that. He was a politician, not a student of history.

Turning his head to look out over the balcony to the terraced hillsides, where the *peons* were hard at work in the coca fields, he murmured, "There is much money to be made in space."

There was much money being made from the coca, I knew. But since the cocaine trade was still illegal the money that came from it could not be put into the national treasury. My father had to keep it for himself and his family, despite his heartfelt desire to help the destitute *peons* who were forced to labor from sunrise to sunset.

The rebels in the hills claimed that my father was corrupt. They were radical ecologists, I was told, who wanted to stop the lumbering and mining and coca cultivation that provided our poor nation's pitiful income. My father saw our seizure of the equatorial orbit as a means of making more money for our country, money that he desperately needed to buy off the rebels—and the next election.

He dabbed at his eyes with his damask napkin, then rose from the breakfast table. I got up too. The servants began clearing the dishes away as we walked side by side from the veranda into the big old house, heading for the door and the limousine waiting for me.

"Be a good soldier, my child," he said to me once we had reached the front door. The butler was waiting there with my packed travel bag. "Be brave. Be fearless."

"I will do my best, Papa."

"I know you will." He gripped me in a full embrace, unashamed of the tears that streamed from his eyes or the fact that he was so much shorter than I that I had to bend almost double to allow him to kiss my cheeks.

My own eyes were misty, as well. Finally he let go of me and I went quickly down the steps to the waiting limousine. While the butler put my bag into the trunk, I turned back to my father, came to attention, and snapped a military salute to him. He returned my salute, then turned away, unable to watch me step into the limo and start the long ride to the airport.

Thus I went to war.

I had been surprised, at first, that Sam Gunn's company had hired me on nothing more than the strength of the faked university credentials of the fictitious person that my father's secret police had created for me. Of course, I knew enough computer programming to pass—I hoped. And of even more course, it would never do for the VCI people to know that I was the daughter of the man who had issued the Declaration of Quito. Even if they ignored our Declaration, I reasoned, they could not possibly be ignorant of it.

VCI was a surprisingly small operation. I reported to their headquarters in Orlando, a modest office building quite near the vast Disney World complex. There were only a couple of dozen employees there, including the company's president, a lanky silver-haired former astronaut named Spencer Johansen.

"Call me Spence," he said when I met him, my first day at VCI. I had just sat down at my own desk in my own office—actually nothing more than a cubbyhole formed by movable plastic partitions that were only shoulder high.

Johansen strolled in, smiling affably, and sat casually on the corner of my bare desk. He offered his hand and I took it in a firm grip.

You must understand that, by any reasonable standard, I was quite an attractive young lady. My hair is the honey blonde of my Castilian ancestry. My figure is generous. I have been told that my eyes are as deep and sparkling as a starry midnight sky. (The young lieutenant who told me that was quickly transferred to a remote post high in the Andes to fight the rebels.) I am rather tall for a woman in my country, although many North American women are as tall as I, and even taller. Nonetheless, I was not that much shorter than Spence, whom I judged to be at least 190 centimeters in height.

"Welcome aboard," he said. His smile was dazzling.

"Thank you," I answered in English. "I am happy to be here." I had worked hard to perfect the Los Angeles accent that my fictitious *persona* called for.

His eyes were as blue as a Scandinavian summer sky. Despite his smile, however, I got the impression that he was probing me, searching for my true motives.

"We had planned to start you off on some of the more routine stuff, but we've got a bit of an emergency cooking and we're kinda shorthanded—as usual."

Before I could reply he went on, "Can you handle a VR-17 simulator? Reprogram it?"

I nodded cautiously, wondering if this was a true emergency or some kind of a test.

"OK," Spence said. "Come on down to the simulations center." He headed for the opening in the partitions that was the doorway to my cubicle. There was no door to it.

I followed him, stride for stride, as he hurried along the corridor. He was wearing a soft blue open-necked, short-sleeved shirt and denim jeans. I wore a simple blouse of salmon pink and comfortable russet slacks. He glanced at me and grinned. "You play tennis?"

"A little." I had won every tournament I had ever entered; the daughter of *el Presidente* had to win, but I thought it would be best to be modest with him.

"Thought so."

"Oh?"

"You're not puffing," he said. "Not many of these desk-jockeys can keep up with me."

"I am curious," I said as we entered the simulations center. It was nothing more than a large windowless room, empty except for the big mainframe computer standing in its center and the desks with terminals atop them set up in a ring around the mainframe. The four corners of the room were bare but for a single cheap plastic chair in each corner.

A man was sitting in one of those chairs, with a virtual reality helmet covering his face and data gloves on both his hands, which twitched in the empty air, manipulating controls that

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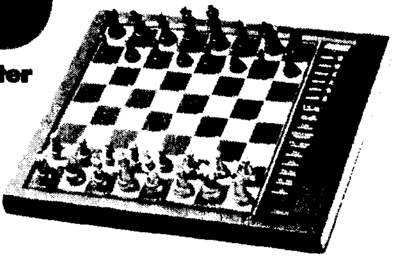

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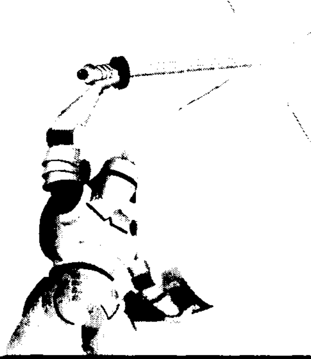

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existed only in the VR programming.

"Curious about what?" Spence asked as he showed me to one of the computer terminals.

I slid into the little wheeled chair. "You are the president of this company, right?"

"Yep."

"But I had the impression that the company belonged to someone named Sam Gunn."

Before Spence could answer, the man in the VR helmet began swearing horribly at the top of his voice. He called down the wrath of God on everyone connected with the machinery he was supposed to be operating, on the person or persons who had programmed the VR simulation, on Isaac Newton and Albert Einstein and all the mathematicians in the world. All the while his hands gesticulated wildly, as if he were desperately trying to ward off a host of devils.

Strangely, Spence grinned at the interruption. Then he turned back to me and said, loud enough to be heard over the continuing tirade of abuse, "I'm the president of VCI, but Sam Gunn is the founder and owns more stock than anybody else. He doesn't like to sell shares to anyone who isn't an employee."

"I can become a stockholder?"

"We have a very generous stock option plan," Spence replied, almost yelling to be heard over the continuous screaming. "Didn't you watch your employee orientation video?"

In truth, I had not. It had never occurred to me that employees might become partial owners of the company. A very clever Gringo, this Sam Gunn. He undoubtedly keeps the majority of shares in his own hands and doles out a pittance to his employees, thereby gaining their loyalty.

As if he could read my thoughts, Spence said, "Sam's a minority stockholder now. My wife and I own more shares than anybody else except Sam, but no individual owns more than a few percent."

Wife? Spence was married. For some reason I felt a pang of disappointment.

"Sam Gunn must be an unusual man," I said, loud enough to be heard over the rantings from the corner of the room. But the instant I started to speak, the ravings stopped, and my voice shrilled stupidly. I felt my face flame red. Spence's grin widened but he said nothing.

"I would like to meet him some day," I said, more softly, as I turned to the computer terminal.

"You can meet him right now," said Spence. "That's him in the VR rig."

My mouth must have dropped open. I spun the little chair around to see Spence looking off toward the corner. The man there was pulling off his VR helmet, still muttering obscenities.

I stared at Sam Gunn as he got up from the chair and tugged the data gloves off. He was short, much shorter than I. His torso was stocky, solid, although I could see that his belly bulged the faded blue coveralls he wore. His face was round, with a little snub of a nose and a sprinkling of freckles. Hair the color of rusted wire, cut very short, and sprinkled with gray—which he insisted (I soon learned) was due to exposure to cosmic radiation in space, not from age. From this distance, halfway across the room, I could not tell the color of his eyes. But I could easily see that he was angry, blazingly furious, in fact.

"Goddammit, Spence," he said, stamping toward us, "if we don't get this simulation fixed, and fixed damned soon, somebody's gonna lose his ass out there."

Spence put a fatherly hand on my shoulder. "Here's the gal who's going to fix it. Just started with us this morning." My shoulder tingled from his touch.

Sam gave me a stern look. "This kid?"

"Juanita O'Rourke," Spence introduced me. It was my alias, of course.

Sam stared at me. Standing, he was about the same height as I was sitting. I saw that his eyes were a bluish-green hazel color, flecked with golden highlights.

"From Los Angeles," Spence added. "Computer programming degree from—"

"I don't care where you're from or where you went to school," said Sam Gunn. "I love you."

I had heard that he was a womanizer of the worst sort. Some of his escapades had been included in the dossier my father's secret police had given me to study. The dossier hinted at much more. Strangely, my father never mentioned the danger that Sam Gunn might pose to me. Perhaps he did not know of it. After all, his attention was focused on affairs of state, not affairs of the bedroom.

I got to my feet and put on a modest smile. Partly it was because I towered nearly thirty centimeters over Sam Gunn. The feeling gave me joy.

"You give your heart quickly," I said, adding to myself silently, *And very often.*

His round, freckled face turned into an elf's delighted countenance. "Will you have dinner with me tonight?"

I hesitated just long enough to let him think I seriously considered his invitation. "Not tonight," I said. "I just arrived here and there's so much to do. . . . "

Spence cleared his throat and said, "You want this simulation checked out, don't you?"

All Sam's anger and frustration had disappeared as quickly as a dry leaf is blown away by a gust of wind. "OK, Esmeralda—"

"Juanita," I corrected.

Sam shook his head. "To me you're Esmeralda, the beautiful gypsy girl that Quasimodo loves."

"I am not a gypsy."

"But you're beautiful," he said.

"And you will be Quasimodo?"

Sam dropped into a crouch and twisted his head up at a bizarre angle. "I'll be whoever you want me to be, Esmeralda."

He made me laugh.

"The simulation," Spence reminded him.

"Oh. Yeah. That."

Fortunately, the problem was simple enough for me to solve, although it took several days' intense work. VCI's major business was removing old commsats that had ceased to function from the geosynchronous orbit so that new commsats could be placed there. There were only a finite number of slots available in GEO, and they were strictly allocated by the International Telecommunications Authority. VCI crews flew from space stations in low Earth orbit (LEO) to GEO and removed the dead commsats to make room for new ones.

It was a small part of the satellite communications industry, but a key factor. VCI also had contracts to sweep debris out of the lower orbits where the space stations flew. I learned that the company's name originally stood for Vacuum Cleaners, Incorporated. Sam's company cleaned up the vacuum of orbital space.

More recently, Sam had begun sending people up to GEO to repair malfunctioning commsats. It was cheaper to fix them than to replace them—in theory, at least. In practice, the costs of sending astronauts to GEO even for a few hours was almost as much as replacing a malfunctioning satellite.

The virtual reality simulation that Sam was frustrated over was one in which an operator could remain aboard the space station in LEO and remotely direct an unmanned spacecraft to repair a malfunctioning satellite in GEO.

"Bring the dead back to life," as Sam put it.

"It would be much safer for our people if they could stay in the space station rather than fly up to GEO," Spence explained to me. "GEO's in the middle of the outer Van Allen Belt. Astronauts can't stay there very long because of the radiation."

"I see," I said.

"We could save a bundle of money if we could do this job remotely," said Sam eagerly. "Just the drop in our insurance costs could pay for the whole program."

Spence added, "In the long run we could operate right here from the ground. No need to send people to one of the space stations, even."

"That'd save even more money," Sam agreed happily.

"But the simulation keeps glitching," said Spence.

"And until we get it right in the simulator we can't try it in the real world."

Thus the burden of their hopes was placed on my young shoulders. I thought it strange that something so vital would be entrusted to a totally new and untried employee. Was this a trap of some sort? Or a test? Soon enough I learned that it was typical of the way Sam Gunn ran his company. He kept his staff as small as he possibly could, hiring only when there was no other way to get a necessary job done. And make no mistake about it, Sam Gunn ran VCI. Despite his lofty title, Spence took orders from Sam. Most of the time.

The problem with the simulation was not terribly difficult. If Sam had not been so impatient his own staff personnel or a consultant would eventually have found it. But what Sam wanted was instant results, which meant that I spent virtually twenty-four hours a day working on the problem. Except for the hour or so each day I spent fending off Sam's invitations to dinner, to lunch, to a

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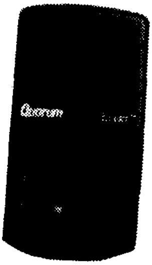

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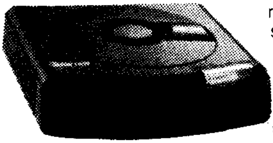

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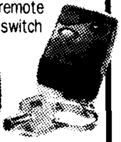

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suite in the zero-gravity honeymoon hotel he wanted to build in orbit.

Within a few days I had the program running so smoothly that Sam was willing to try a test in orbit. And I realized that I could sabotage his operation quite easily. In fact, I planted a bug in the program that I could activate whenever I chose to.

I discussed my accomplishment with my father on the direct phone link from our consulate in Orlando. I drove to the consulate in the dark of night, well past midnight, to make certain that no one from VCI would see me.

I had feared that I would wake my father from his justly-earned sleep. As it turned out, he was in bed, but not asleep. At first he did not activate the phone's video, which puzzled me. When he finally did, I realized that he was not alone in his bed. He tried to hide her, but I could see that a tousle-haired young trollop lay beside him, bundled under the sheets. She peeked out from behind my father's back, showing a bare shoulder, a pair of flashing dark eyes, and piles of raven black hair.

My father was delighted with the progress I had made in little more than a week.

"I can sabotage their mission to repair satellites," I reported to him, trying to ignore his companion. She could not have been much older than I. "And they will never even know that sabotage has occurred."

"Good!" He beamed at me. "Excellent! But do not attack them just yet. Let them run a successful mission or two. Wait until the strategic moment to strike."

"I understand, Papa."

"You are doing well, my child."

I looked past him to the young woman sharing his bed. My mother had been dead for many years and my father was still a man of vigor. Yet I felt angry. I did not tell him that Sam Gunn was attracted to me.

"And you are well, Papa?" My question sounded acidly cynical to my own ears.

Yet my beloved father obviously did not feel my anger. "I am in good health," he reported smilingly. "Although the rebels have surrounded the army base at Zamora."

"What?" I felt a double pang of alarm. The lieutenant who had been infatuated with me was at the Zamora base.

"Not to worry, my daughter. We are reinforcing the base by helicopter and will soon drive the scum back to their caves in the mountains."

Yet I did worry. The rebels seemed to get bolder, stronger, each year. I went back to work, angry with my father yet frightened for him. We needed to wrest control of the equatorial orbit from the Gringo corporations, quickly. I began to look for more ways to sabotage VCI. I even let Sam take me out to dinner several times, although each evening ended at the front door of my apartment building with nothing more romantic than a handshake. Sam was not exactly a perfect gentleman: he was as persistent as a goat in mating season. I fended him off, however. My arms were longer than his.

"Esmeralda," he complained one

evening, "you're turning my love life into the petrified forest."

We were at the entrance to my apartment building. I thought of it as my castle, its walls and electronic door locks my defense against Sam's assaults.

"I agreed to have dinner with you," I said, "nothing more."

He sighed heavily. "I guess I'm paying you too much."

"Paying me. . . ? "

With an almost wicked grin he said, "If you were broke and hungry you'd appreciate me more, I betcha."

"What an evil thing to say!"

"Well, look at this apartment building," he went on. "It's a frigging luxury palace! I'm just paying you too much money. You're living too well—"

I had to cut off his line of thought before he realized that my salary could never pay the rent on my apartment. Before he began to ask himself how a poor computer programmer from Los Angeles could afford the clothes and the sports car I had.

"So you want women to be starving and poor," I snapped at him. "Or perhaps you prefer them barefoot and pregnant?"

He shrugged good-naturedly. "Barefoot is OK."

I did not have to pretend to be angry. I could feel the blood heating my cheeks. "Sam, the days of male domination over women were finished long ago," I told him. "Don't you understand that?"

"I'm not interested in domination. All I want is a little cooperation."

"You are a hopeless chauvinist, Sam."

He broke into an impish grin. "Not quite hopeless, Esmeralda. I still have some hope."

It was impossible to dislike Sam, even though I tried. But at least I stopped him from asking himself how I could afford my lifestyle on the salary he was paying me.

Yet it was Spence that I felt drawn to. He was quietly competent, always even-tempered, extremely capable. I knew he was married, but somehow I felt that his marriage was not all that happy for him. Perhaps it was because I wanted to believe so. Perhaps it was because he was a kind, fatherly, caring, truly gentle man.

And then I met Spence's wife. Her name was Bonnie Jo. Apparently she had once been engaged to marry Sam Gunn but somehow had married Spence instead. The story I gathered from my fellow workers was that her father had provided the money for Sam to start VCI. Spence had mentioned that he and his wife were both stockholders, which made me wonder if her father was still a financial backer of the company.

But it was not her finances that stunned me. It was her beauty. Bonnie Jo's hair was the color of lustrous gold, her eyes a rich, deep, mysterious grayish green. She was almost as tall as I, her figure slim and athletic, her clothes always impeccably stylish. Compared to her, I felt fat and stupid. Her voice was low, melodious; not the piercing high-pitched shrill of so many Gringo women. But her eyes were hard, calculating; her beauty was cold, like an exquisite statue or a fashionably-draped mannequin.

It quickly became clear to me that she no longer loved Spence, if she ever had. She was cool to him, sometimes cruelly so, as when she bought herself a sapphire ring for her own birthday and loudly announced that Spence could not have afforded it on the salary Sam gave him.

For his part, Spence buried himself in his work, driving himself deeper and deeper into the technical side of VCI, leaving the administration to Bonnie Jo and the office staff. This brought us together every day. I realized that I was falling in love with this handsome, kind, suffering older man. I also realized that he saw me as nothing more than another employee, young enough almost to be his daughter.

Spence traveled to Space Station Alpha to personally test the program for remotely repairing satellites in GEO. I remained in Orlando, at VCI's mission control center. It was a tiny room, big enough only for three monitoring stations. Windowless, it would have been unbearably stuffy if the air conditioning had not been turned up so high that it became unbearably frigid. The front wall was one huge display screen, which could be broken into smaller displays if we desired.

I sat at the right-hand monitor, almost shivering despite the sweater I wore, ready to give whatever assistance I could to the man who was actually controlling Spence's mission. We both wore earphones clamped over our heads, with pin-sized mikes at our lips. However, the mission controller was supposed to do all the talking; I was told to remain silent. Sam took the third seat, on the left, but it was empty most of the time because Sam hardly sat still for two seconds at a time. He was constantly bouncing out of his chair, pacing behind us, muttering to himself.

"This has gotta work, guys," he mumbled. "The whole future of the company's riding on this mission."

I thought he was being overly dramatic. Only later did I come to realize that he was not.

The big display screen before us showed a telescope view from Alpha of our Orbital Transfer Vehicle as it approached the satellite that needed repair. The OTV was an ugly contraption: clusters of spherical tanks and ungainly metal struts. At its front a pair of mechanical arms poked out stiffly. Ridiculously small rocket nozzles studded the vehicle fore and aft and around its middle; they reminded me of the bulbous eyes of a mutant iguana.

I could feel Sam's breath on my neck as Spence's voice said, "Shifting to on-board camera view."

"Roger, on-board view," said the mission controller, sitting at my elbow.

The screen abruptly showed a close-up view of the malfunctioning satellite. It seemed huge as it hung serenely against the black backdrop of space.

"Starting rendezvous sequence," Spence's voice said. Calmly, quietly, as unruffled as a man tying his shoelaces.

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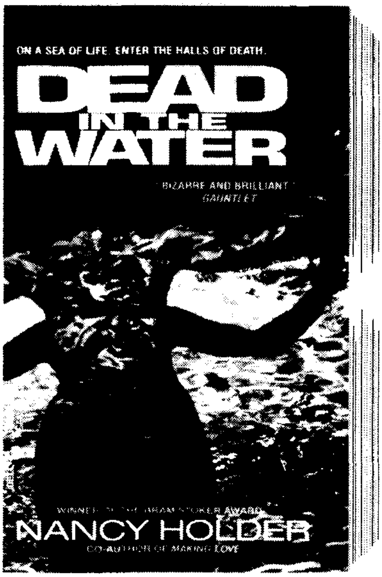
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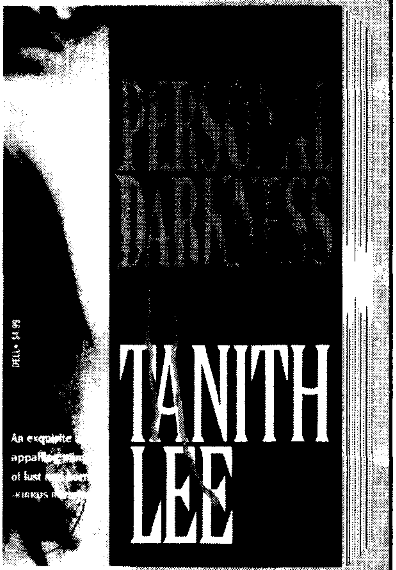
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Sam was just the opposite. "Keep your eyes glued on the readouts," he snapped. "And your finger on the abort button. The *last* thing we want is a collision out there."

He was speaking to the mission controller, I knew, but his words applied to me as well. I had inserted a subroutine into the automatic rendezvous program that would fire an extra burst of thrust at the critical moment. Not only would the OTV be destroyed, but the communications satellite, too. VCI would be sued by the commsat's insurer, at the very least. All I had to do was touch one keypad on the board in front of me. Despite the frigid air-conditioning I began to perspire.

But I kept my hands in my lap as calmly, methodically, Spence achieved the rendezvous and then directed the OTV's machinery to remove the malfunctioning power conditioner from the commsat and insert the new one. I watched the screen, fascinated, almost hypnotized, as the robot arms did their delicate work, directed by Spence's fingers from more than thirty thousand kilometers' distance.

At last the mission controller said into his microphone, "I copy power conditioning checkout in the green. Move off for communications test."

"Moving off for comm test." The mission plan called for the OTV to back away from the commsat while its owners in Tokyo tested the new power conditioner to make certain it properly fed electrical power to the satellite's forty transponders.

The display screen showed the commsat dwindling away. And then the great glowing blue curve of the Earth swung into view, speckled with dazzling white clouds. I felt my breath gush from me. It was overwhelming.

I heard Spence chuckle in my earphone. "I'll bet that's Juanita."

"Yes," I replied without thinking. I glanced at the mission controller. Instead of frowning at my breaking the mission protocol, he was grinning at me.

"Never seen the view from orbit before, huh?" Spence asked.

"Only photographs in magazines or videos," I said.

"Welcome to the club," said Spence. "It still gets me, every time."

"Let's get back to work, shall we?" Sam said. But his voice was strangely subdued.

The word came from Tokyo that the power conditioner functioned perfectly. A seventy-million-dollar commsat had been saved by replacing one faulty component.

Now it was Sam who gushed out a heartfelt sigh. "Good work, guys. C'mon, I'm gonna buy you all the best dinner in town."

I wanted to stay at my monitoring station and talk with Spence. But I could not. The mission controller cut the link to him even before I could say *adios*.

For some reason, Sam insisted that Bonnie Jo join us. So he bundled the four of us into his leased Mercedes and drove us to a Moroccan restaurant on the strip just outside Disney World.

"You're gonna love this place," Sam

assured us as our turbanned host guided us to a table by the dance floor, a big round engraved brass table, barely a few centimeters off the floor. There were no chairs, only pillows scattered around the table.

"Relax, kick your shoes off," Sam said as he flopped onto one of the big pillows. "The belly dancers start in a few minutes."

The restaurant was small, almost intimate. Although smoking in restaurants had been outlawed for decades, the management filtered a thin gray haze (non-toxic, the menu assured us) through the air-conditioning system. For "atmosphere," the menu said. The food was surprisingly good, roasted goat and couscous and a tangy sauce that reminded me of the best Mexican dishes. But it was clear that Sam had come to see the dancers. And that he had seen them many times before. They all seemed to recognize him and to spend most of their performance close enough to our table for me to smell the heavy perfumes they used.

Our mission controller's name was Gene Redding. He was well into his forties, balding, portly and very competent at his job. As he sat on the pillows gazing up at the dancers gyrating within arm's reach, his face turned redder and redder and his bald pate began to glisten with perspiration. His glasses kept fogging, and he constantly removed them to wipe them clear, squinting at the dancers all the while. From the silly grin on his face it was obvious that he was enjoying the entertainment.

Conversation was impossible while the dancers were on. The reedy music and thumping percussion were too loud, and the men were too engrossed. I saw that Bonnie Jo was just as interested in the dancers as the men were. I must admit that they were fascinating: erotic without being vulgar. God knows what fantasies they stirred in the men's minds.

It was on the drive back to the office that the argument began.

"We turned the corner today," Sam said happily as he drove along Interstate 4. "Now the money's gonna start pouring in."

"And you'll pour it all out again, won't you, Sam?" said Bonnie Jo.

She was sitting in the back seat, with me. Gene was up front with Sam.

"I'm gonna invest it in the company's growth," Sam said lightly.

"You're going to sink it into your idiotic orbital hotel scheme." It sounded to me as if Bonnie Jo was speaking through gritted teeth.

"Idiotic?" Sam snapped. "Whattaya mean, idiotic? People are gonna pay good money for vacations in zero-g. It's gonna be the honeymoon capital of the world!"

"Sam, if just for once you'd think with your brain instead of your testicles, you'd see what a damned fool scheme this is!"

"Yeah, sure. They laughed at Edison, too."

"We can't piss away our profits on your hare-brained schemes, Sam!"

"As long as I'm the biggest stockholder I can."

I noticed that we were going faster as the argument got hotter. Sam was using neither the highway's electronic guidance system nor the car's cruise control; his rising blood pressure made his foot lean harder on the car's accelerator.

Bonnie Jo said, "Not if I can get a bloc to out-vote you at the annual meeting."

"You tried that before and it didn't get you very far, did it?"

"Spence will vote on my side this time," she said.

The other cars were blurring past us, streaks of headlights on one side, streaks of red taillights on the other. I felt like a crew member in a relativistic starship.

"The hell he will," Sam yelled back. "Spence is solidly behind me on this. So's your father."

"My father has already given me his proxy."

Sam was silent for several moments. We sped past a huge double trailer rig like a bullet passing a tortoise.

"So what," he said at last. "Most of the employees'll vote my way. And that includes Spence."

"We'll see," said Bonnie Jo.

"We sure as hell will."

So there were internal strains within VCI's top management. My discovery of this pleased me very much, mainly, I must confess, because I realized that Spence and Bonnie Jo were truly unhappy with one another. I began to think that I might use their differences to destroy VCI—and their marriage.

But Sam had other ideas. So did my father. And also, so did the rebels.

The following Friday afternoon Sam popped into my cubbyhole of an office, whistling off-key and grinning at the same time. It made him look rather like a lopsided Jack-o-Lantern.

"Got any plans for the weekend?" he asked me as he pulled up the only other chair in my cubicle, turned it backwards, and straddled it.

I certainly did. I was planning to spend the weekend at my desk, studying every scrap of data I could call up on my computer about VCI's finances. I already knew enough about the technical operations of the company. Sam's argument with Bonnie Jo had opened my eyes to the possibilities of ruining the corporation by financial manipulations.

"I will be working all weekend," I said.

"You sure will," said Sam, crossing his arms over the back of the little plastic chair and leaning his chin on them.

His mischievous grin told me that he had something unusual in mind. I merely stared at him, saying nothing, knowing that he was bursting to tell me whatever it was.

Sure enough, Sam could not remain silent for more than two heartbeats. "Ever been in orbit?" he asked. Quickly he added, "Literally, I mean. In space."

I blinked with surprise. "No. Never."

His grin widened. "OK, then. Pack an overnight bag. You're going up tomorrow morning. I'll have you back here in time to be at your desk first thing Monday morning."

"You're taking me into space?"

"Space Station Alpha," he said.

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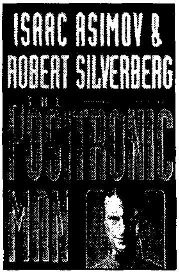

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"You'll love it."

"With you?"

He tried to put on a serious expression. "Strictly business, Esmeralda. Strictly business. You'll have a private compartment in the one-*g* section."

"But why?"

"Company policy. Everybody who works for VCI gets a chance to go into orbit."

"This is the first time anyone's told me about it," I said.

His grin returned. "Well . . . it's a new company policy. I just made it, as a matter of fact."

I realized his intention. "So you merely want to get *me* into space with you."

"It'll be business, I swear," Sam said, trying to look innocent.

"What business?" I asked. All my instincts were ringing alarm bells within me.

"I need a woman's opinion about my plans for the orbital hotel. Can't ask Bonnie Jo, she's dead-set against the idea."

I must have frowned, because he swiftly added, "I'm talking about the way the compartments are done up, the facilities and the decorations and all that. The food service. I need a woman's point of view, honest."

He almost sounded reasonable.

But his grin would not fade away. "Of course, if the mood strikes you, and you start to feel romantic, I could show you the zero-*g* section of the station and we could accomplish feats that could never be done on Earth."

"No!" I snapped. "Never!"

"Aw, come on," Sam pleaded like a little boy. "I'll behave myself, honest. I really do need your opinion. It's business, really it is."

My mind was racing furiously. The more I knew about Sam's operations the easier it would be to trip him up, I reasoned. However, I knew that no matter how much he protested, his lecherous male mind still entertained the hope that he could seduce me, still harbored fantasies of making love with me in zero gravity. I had to admit to myself that I harbored a similar fantasy—except that it was Spence I fantasized about, not Sam.

"Listen," Sam said, interrupting my train of thought. "I know you think I'm a male chauvinist and all that. OK, maybe I am. But I'm not a rapist. If anything happens between us it'll be because you want it to happen as much as I do."

"I should be perfectly safe, then."

He laughed. "See? You've got nothing to fear."

Still I hesitated. His reputation worried me. Apparently he could be irresistibly charming when he wanted to be.

He heaved a great, disappointed sigh, threw his hands up over his head and said, "All right, all right. You want a chaperon to go with us? You got it. I'll ask Spence to come along, too. How's that?"

I had to exert every iota of self-control I possessed to keep myself from leaping out from behind my desk and shouting Yes! Yes! Very deliberately, I turned my gaze away from Sam's eager eyes and studied the blank wall behind him, pretending to think mightily.

At last I said, "A chaperon is proper. But it should be a woman. A dueña."

Sam sighed again, this time in exasperation. "Look, I can't shuttle people up and back to a space station just to keep your Hispanic proprieties. D'you know how much it costs?"

"But you are taking me," I said.

"I need your mother-loving feminine opinion about the hotel accommodations, dammit! And Spence has useful work to do for the company at Alpha. That's it!"

"Very well," I said with as much reluctance as I could feign. "Spence is a married gentleman. He is not as good as a proper dueña, but I suppose he can be trusted to act as our chaperon."

Sam jumped to his feet, bowed deeply, and pranced out of my cubicle. Only when I was certain that he could not see me did I allow myself to smile.

Less than a quarter-hour later a young man appeared at my open doorway. He looked like a Latino: somber dark eyes, thick curly black hair, skin the color of smoked parchment. He was handsome, in a smoldering, sullen way. Sensuous lips.

"Ms. O'Rourke?" he asked.

"Yes."

"I'm supposed to give you an orientation tour. For your ride up to Alpha." His tone was little short of insolent.

"Right now? I'm busy. . . . "

He shrugged disdainfully. "Whenever you're ready, princess. Sam told me to hang around until you've got an hour of free time."

Princess? I seethed inwardly, but maintained a calm exterior. I would not give this sneering youth the satisfaction of seeing that he could anger me.

"I won't be ready until sometime after six," I said.

Again he shrugged. "Then I'll hafta hang around until after six."

"Where will I find you?"

A spark of something glinted in his eyes. Perhaps it was anger. "I'll be in the simulations lab, back down the main corridor, past—"

"I know where the simulations lab is," I said.

"OK. See you whenever you get there." He turned and started to leave.

"Wait!" I called. "What is your name?"

"Gregory Molina," he answered over his shoulder. "Extension 434."

It was close to seven-thirty before I finished my day's work and made my way to the simulations lab. Although quitting time at VCI was nominally six, there were still plenty of people in the corridors and offices. Many of Sam's employees worked long hours. Most of them, in fact.

But the simulations lab seemed deserted. The computer in its center was dark and silent. The overhead lights were dimmed. I stood in the doorway frowning with uncertainty. He had said he would be here. How dare he leave without informing me?

"You ready for your orientation spin?"

The voice from behind startled me. I turned and saw that it was Molina. He held a frosted can of cola in one hand.

"Dinner," he said, hoisting the can before my face. "Want some?"

"No thank you. Let's get this over with."

"OK. It's pretty simple," he said as he ushered me inside the lab. The ceiling lights brightened automatically. "IAA safety regulations require anyone flying into orbit for the first time to have an orientation simulation and lecture. The lecture is taped and you can see it on one of the display screens here or take a copy home with you and view it at your leisure. Which do you prefer?"

"I'll see it here," I said.

He nodded. "Sure. There's another half-hour I'll have to hang around twiddling my thumbs."

His attitude angered me. "Really!" I snapped. "If it's your job to do this, why are you so nasty about it?"

He stared straight into my eyes. "My *job,* señorita, is maintaining these goddamned computers. What I'm doing now is extra."

"Maintaining the computers? But I've never seen you here."

"You haven't noticed," he replied sullenly. "I've been here. I've seen you plenty of times. But you just look right past the hired help, like some goddamned princess or something."

"That's no reason to be angry with me."

"That's not why I'm pissed off."

"And there's no need for such vulgar language!"

*"Dispense Usted perdón, princesa,"* he said, with a horrible accent.

"Where are you from?" I demanded.

"Los Angeles," he said as he guided me to one of the monitoring desks that ringed the computer.

"And what makes you so angry?"

He snorted. "The thought that a refined lady like you would willingly ride into a tryst in space with an Anglo."

"A tryst? Is that what you think I'm doing?"

"What else?"

I wanted to slap his sullen, accusing face. But I decided that I would not dignify his anger with any response whatsoever.

"Let's get this orientation over with," I said, barely controlling my temper. "Then we can both go home."

I watched the taped lecture. Then he silently led me to one of the simulation areas and helped me don the VR helmet and gloves. I "rode" in virtual reality aboard a Delta Clipper from Cape Canaveral to Space Station Alpha. The simulation did not provide the physical sensations of acceleration or zero gravity: it was strictly a safety review, showing the interior layout of the Clipper's passenger cabin, the escape hatches, and the emergency oxygen system.

At last it was finished and I pulled the helmet off. Molina was standing beside me; he took the helmet from my hands.

"I am not engaging in a tryst with Sam Gunn," I heard myself mutter as I wormed off the VR gloves.

He gave me a smoldering look. "I'm glad to hear it, even if it's not true."

"I do not tell lies!"

For the first time, he smiled at me. It was only half a smile, really, but it made him look much better. "I'm sure you're telling the truth. But you don't know Sam."

I almost wanted to tell him that I loved Spence, not Sam. But that would have been foolish. Apparently the rumors flew thick and fast through the whole company. Already it was taken for granted that Sam and I would make out in zero-*g*. Besides, telling him how I felt about Spence would have made him angry all over again.

So I tried to shift the conversation as we walked along the corridor to the building's front entrance. The halls were mostly deserted now. Even Sam's most dedicated employees eventually went home to their families and friends.

"I am from Los Angeles, too, you know," I said.

"Really? What part?"

Quickly I realized I had put my foot into a quagmire. "Oh, I went to UCLA," I said. "I lived just off the campus."

"Westwood, huh?"

Actually I had lived in a leased condominium in the Pacific Palisades, with a magnificent view of the beach and the sunsets over the ocean.

"When I said Los Angeles," he told me as we reached the front door, "I meant the city. The *barrio.* Downtown."

"Oh." I had heard about the squalor and crime in the downtown area, but had never visited such a slum.

We stepped out into the soft warm breeze of a balmy Florida evening.

"You were born there?" I asked as we walked toward our cars.

It was dark in the parking lot. Suddenly I was glad of his companionship.

"No," he answered. "My parents came to Los Angeles when I was an infant."

"And where were you born?" I asked.

"In Quito."

I felt stunned. Quito!

"That's the capital of Ecuador," he explained, misunderstanding my silence. "My father was a university professor there but he was driven out by the dictator."

"Dictator?" I snapped. "Ecuador is a democracy."

"Democracy hell! It's a dictatorship, run by a little clique of fascist bastards."

I felt myself shaking from head to toe. My throat went dry with suppressed anger.

"Someday I'll go back to Ecuador," Gregory Molina said. "Someday there's going to be a reckoning. The people won't stand for this corrupt regime much longer. Revolution is on the way, you'll see."

In the shadows of the parking lot I could not make out the expression on his face or the fire in his eyes. But I could hear it in his voice, his passionate, fervent voice, filled with hatred for my father. And if he knew who I really was, he would hate me, too.

I slept hardly at all that night, worrying about my father and the rebels and the seething hatred I had heard in young Gregory Molina's voice. When I did manage to close my eyes

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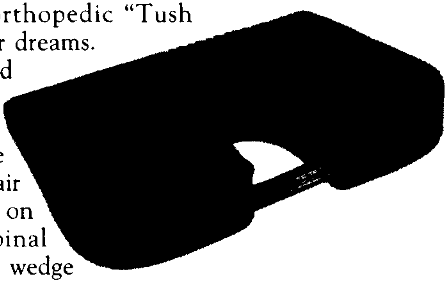

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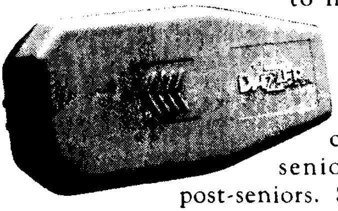

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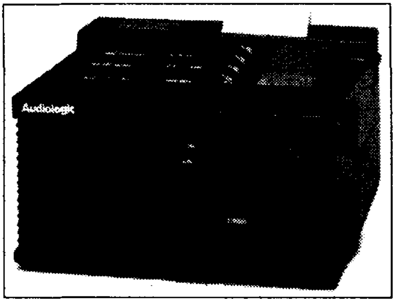

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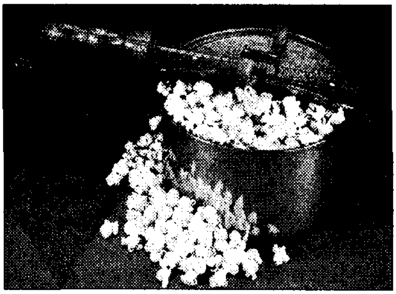

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I was racked by terrifying nightmares in which I was struggling to climb the sheer face of a high cliff with Sam up above me and Spence below. I saw the rope connecting me to Sam begin to fray. I tried to shout but no sound would come from my throat. I tried to scream but I was helpless. The rope snapped and I plunged down into the abyss, past Spence who reached out to save me, but in vain.

I woke screaming, bathed in perspiration, tangled in my bedsheets. And I realized that in the last moment of my nightmare the man who reached toward me was not Spence after all. It was Gregory.

Dawn was breaking. Time to get up anyway.

I was applying the final dab of mascara when the apartment's intercom chimed. I called out to it and Sam's voice rasped, "Arise Esmeralda. Your knight in shining armor is here to whisk you away to the promised land."

I had seldom heard such a mixture of metaphors.

We drove to the Cape in Spence's reconditioned antique Mustang, gleaming silver, with me crammed into the tiny rear seat and the top down. My careful hairdo was blown to tatters once we hit the highway but I did not care; it was glorious to race in the early morning sunlight.

Despite my VR orientation, I gulped as we strapped ourselves into the contoured chairs of the Delta Clipper. It was a big, conical-shaped craft, sitting in the middle of a concrete blast pad. It reminded me of the ancient round pyramids of Michoacan, in Mexico: massive, tall and enduring. But this "pyramid" was made of lightweight alloys and plastics, not stone. And it was intended to fly into space.

After all my fears, the actual takeoff was almost mild. The roar of the rocket engines was muffled by the cabin's acoustical insulation. The vibration was less than my orientation simulation had led me to believe. Before I fully realized we were off the ground the ship had settled down into a smooth, surging acceleration.

And then the engines shut off and we were coasting in zero gravity. My stomach felt as if it were dropping away to infinity and crawling up my throat, both at the same time. The medicinal patch Sam had given me must have helped, though, because in a few moments my feeling of nausea eased. It did not disappear entirely, but it sank to a level where I could turn to Spence, sitting beside me, and make a weak grin.

"You're doing fine," he said, treating me to that dazzling smile of his. I did not even mind that the loose end of his shoulder belt was floating in the air, bobbing up and down like a flat gray snake.

Sam, of course, unclipped his harness as soon as the engines cut off and floated up to the padded ceiling.

"This is the life!" he announced to the ten other passengers. Then he tucked his knees up under his chin and did a few zero-g spins and tumbles.

The other passengers were mostly experienced engineers and technicians riding up to Alpha for a stint of work on the space station. One of them, however, must have been new to zero-*g*. I could hear him retching into one of the bags that had been thoughtfully placed in our seatbacks. The sound of it made me gag.

"Ignore it," Spence advised me, placing a cool, calm hand on my arm. With his other hand he pointed at the acrobatic Sam. "And ignore him, too. He does this every trip, just to see who he can get to throw up."

Once we docked with Alpha and got down to the main wheel of the station, everyone felt much better. Except Sam. I believe he truly preferred zero-*g* to normal gravity.

Alpha station was a set of three nested wheels, each at a different distance from the center to simulate a different level of gravity. The outermost wheel was at one *g*, normal Earthly gravity. The second was at one-third *g*, roughly the same as Mars. The innermost was at the Moon's level of one-sixth *g*. The hub of the station was, of course, effectively zero gravity, although some of the more sensitive scientific and industrial experiments were housed in "free flyers" that floated independently of the space station's huge, rotating structure.

Much of the main wheel was unoccupied, I saw. Long stretches of the sloping corridor stood bare and empty as Sam and I walked through them. Nothing but bare structural ribs and dim overhead lights. Not even any windows.

"Plenty of room for hotel facilities here," Sam kept muttering.

Spence had disappeared into the area on the second wheel that VCI had leased from Alpha's owner, Rockledge Industries. He had come up to work on the satellite repair facility we had established there, not merely to chaperon me.

"But Sam," I asked as we strolled through the dismally empty corridor, "why would anyone pay the price of a ticket to orbit just to be cooped up in cramped compartments in a space station? It's like being in a small ocean liner, down in steerage class, below the waterline."

He smiled as if I had stepped into his web. "Two reasons, Esmeralda. One—the view. You can't imagine what it's like to see the Earth from up here until you've done it for yourself."

"I've seen photos and videos. They're breathtaking, yes, but—"

"But not the real experience," Sam interrupted. "And then there's the second reason." He broke into a lecherous leer. "Making love in zero gravity. It's fantastic, lemme tell you."

I did not respond to that obvious ploy.

"Better yet, lemme show you."

"I think not," I said coolly. But I wondered what it would be like to make love in zero gravity. Not with Sam, of course. With Spence.

Sam's expression turned instantly to wounded innocence. "I mean, lemme show you the zero-*g* section of the station."

"Oh."

"Did you think I was propositioning you?"

"Of course."

"How could you? This is a business

trip," he protested. "I even brought you a chaperon. My intentions are honorable, cross my heart." Which he did, and then raised his right hand in a Boy Scout's salute.

I trusted Sam as far as I could throw the cathedral of Quito, but I followed him up the long passageway to the hub of the space station. It was a strange, eerie journey. The passageway was nothing more than a long tube studded with ladder-like rungs. With each step the feeling of gravity lessened until it felt as if we were floating, rather than climbing. Sam showed me how to let go of the rungs altogether, except for the faintest touch against them now and then to propel myself up the tube. Soon we were swimming, hardly touching the rungs at all, hurtling faster and faster along the long metal tube.

I realized why the standard uniform for the space station was one-piece coveralls that zippered at the cuffs of the trousers and sleeves. Anything else would have been undignified, perhaps even dangerous.

The tube was only dimly lit, but I could see up ahead a brighter glow coming from an open hatch at the end. We were whipping along by now, streaking past the rungs like a pair of dolphins.

And then we shot into a huge, empty space: a vast hollow sphere with padded walls. Sam zoomed straight across the center and dove head-first into the curving wall. It gave and he bounced back toward me. I felt as if I had been dropped out of an airplane. I was falling and there was no way I could control myself.

Then Sam grabbed me as we passed each other. His hands gripped my flailing arms and I was surprised at how strong he was. We spun around each other, two astronomical bodies suddenly caught in a mutual orbit. I was breathless, unable to decide whether I should scream or laugh. Slowly we drifted to the wall and nudged against it. Sam flatted his back against the padding, gaining enough traction to bring us both to a stop.

"Fun, huh?"

It took me several moments to catch my breath. Once I did, I realized that Sam was holding me in his arms and his lips were almost touching mine.

I pushed away, gently, and floated toward the middle of the huge enclosure. "Fun, yes," I admitted.

We spent nearly an hour playing games like a pair of schoolchildren let loose for recess. We looped and dived and bounced off the padded walls. We played tag and blindman's bluff, although I was certain that Sam cheated and peeked whenever he felt like it.

Finally we hovered in the middle of the empty sphere, sweating, panting, an arm's length from one another.

"Well," Sam said, running a hand over his sweaty brow, "whattaya think? Worth the price of a ticket to orbit?"

"Yes! Well worth it. I believe people will gladly pay to come here for vacations."

"And honeymoons," Sam added, with his impish grin. "You haven't even tried the best part of it yet."

I laughed lightly. There was no

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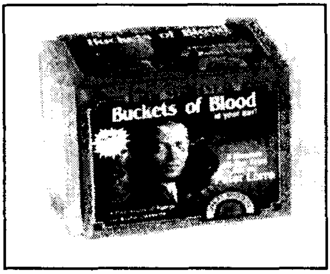

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sense getting angry at him. "I think I can imagine it well enough."

"Ah, but the experience, that's the thing."

I looked into his devilish hazel eyes and, for the first time, felt sad for Sam Gunn. "Sam," I said as gently as I could, "you must remember that Esmeralda loves the young poet, not Quasimodo."

His eyes widened with surprise for a moment. Then his grin returned. "Hell, you don't have to follow the script *exactly*, do you?"

He was truly incorrigible.

"It must be time for dinner," I said. "We should get back to the galley, shouldn't we?"

So we started up the tube and, as the gravity built up, found ourselves clambering down the rungs of the ladder like a pair of firefighters descending to the street.

"You mean you're in love with somebody else?" Sam's voice echoed along the metal walls of the tube.

He was below me. I could see his face turned up toward me, like a round ragamuffin doll with scruffy red hair. I pondered his question for a few moments.

"I think I am," I answered.

"Somebody younger? Somebody your own age?"

"What difference does it make?"

He fell silent for several moments. At last he said softly, "Well, he better treat you right. If he gives you any trouble you tell me about it, understand?"

I was so surprised at that I nearly missed my step on the next rung. Sam Gunn being fatherly? I found it hard to believe, yet that was what he seemed to be saying.

Spence was already in the galley when we got there.

Sam showed me how to work the food dispensers as he explained, "This glop is barely fit for human consumption. I think Rockledge has some kind of experiment going about how lousy the food has to be before people stop eating it and let themselves starve."

I accepted a prepared tray from the machine and went to the table where Spence was sitting. There were only ten tables in the galley, and most of them were empty.

"Experienced workers bring their own food up with them and microwave it," Sam kept rattling on. "Of course, when I open the hotel I'll have a *cordon bleu* chef up here and the best by-damn food service you ever saw. Cocktail lounge, too, with real waitresses in cute little outfits. None of those idiot robots like they have down at the Cape. . . . "

He chattered and babbled straight through our meager dinner. In truth, the food was not very appetizing. The soy burger was too cool and the iced tea too warm. I am sure it was nutritious, but it was also bland and dull.

Spence could barely get a word in, the way Sam was nattering. I was content to let him do the talking. Suddenly I felt extremely tired, worn out. It had been a demanding day, with the flight from the Cape and Sam's zero-*g* acrobatics. I had barely slept the night before and had arisen with the dawn.

I yawned in Sam's face. And immediately felt terribly embarrassed. "Sorry," I apologized. "But I am very tired."

"Or bored," Sam said, without a trace of resentment.

"Tired," I repeated. "Fatigued. I didn't sleep well last night."

"Too much excitement," Sam said.

Spence said nothing.

"I must get some sleep," I said, pushing my chair back.

"Can you find your room all right?" Spence asked.

"I think so."

"I'll walk you to your door," he said, getting to his feet.

Sam remained seated, but he glanced first at me and then at Spence. "I've got a few things to attend to," he said, "soon as I finish this glorious Rockledge repast."

So Spence walked with me along the sloping corridor toward the area where the sleeping compartments were.

"Sam works very long hours, even up here," I said.

Spence chuckled. "He's working on a couple of Rockledge people. Of the female variety."

"Oh?"

"The little guy's always got something going. Although I've got to admit," Spence added, "that he gets a lot of dope about what Rockledge is doing from his—uh, contacts."

"A sort of masculine Mata Hari?" I asked.

Spence laughed outright.

As we neared the door to my compartment I heard myself asking Spence, "Why don't they have windows in the compartments? It makes them feel so small and confined."

Even as I spoke the words I wondered if I wanted to delay the moment I must say goodnight to Spence, or if there was another reason.

"The station's spinning, you know," he replied, completely serious. "If you had a window in your compartment you'd see the stars looping around, and then the Earth would slide past, and maybe the Moon, if it was in the right position. Could make you pretty queasy, everything spinning by like that."

"But Sam said the view was magnificent."

"Oh, it is! Believe me. But that's the view from outside, or down at the observation blister in the hub."

"I see."

"Sam plans to put a video screen in each of his hotel rooms. It'll look like a window that gives you a steady view of the Earth or whatever else you'd like to see."

So after all his talk about seeing "the real thing," Sam was prepared to show his hotel guests little more than video images of the Earth from space. That was just like the Gringo capitalist exploiter, I told myself.

Yet I heard myself asking Spence, "Is the view truly magnificent?"

"Sam didn't show you?"

"No."

His face lit up. "Want to see it now? You're not too tired, are you? It'll only take—"

"I'm not too tired," I said eagerly. "I would like very much to see this fabulous view."

All the way along the long tube leading to the station's hub a voice in my mind reprimanded me. You know why you asked him about the windows, it scolded. You *wanted* Spence to take you to the zero-*g* section.

We floated into the big padded gym. Spence propelled himself to a particular piece of the padding and peeled it back, revealing a small hatch. He opened it and beckoned me to him. I pushed off the curving wall and swam to him, my heart racing so hard I feared it would break my ribs.

Spence helped me wriggle through the narrow hatch, then followed me into a small, cramped dome. There was barely room enough for the two of us. He swung the hatch shut and we were in total darkness.

"Hang on a minute. . . ." he mumbled.

I heard a click and then the whir of an electric motor. The dome seemed to split apart, opening like a clamshell. And beyond it—

The Earth. A huge brilliant blue curving mass moving slowly, with ponderous grace, below us. The breath gushed out of me.

Spence put his arm around my shoulders and whispered, "Lord, I love the beauty of thy house, and the place where thy glory dwells."

It was—there are no words to do it justice. We huddled together in the transparent observation blister and feasted our eyes on the world swinging past, immense and glorious beyond description. Deep blue seas and swirling purest white clouds, the land brown and green with wrinkles of mountains and glittering lakes scattered here and there. Even the dark night side was spectacular with the lights of cities and highways outlining the continents.

"No matter how many times you've seen it," Spence said, "it still takes your breath away. I could watch it for hours."

"It's incredible," I said.

"We'll have to build more observation blisters for the hotel guests. Stud the whole zero-section with them."

The panorama was ever-changing, one spectacular scene blending imperceptibly into another. We saw the Sun come up over the curving horizon, shooting dazzling streamers of red and orange through the thin layer of the atmosphere. I recognized the isthmus of Panama and the curving bird's head of the Yucatan.

"Where is Ecuador?" I asked.

"Too far south for us to see on this swing. Why do you want to see Ecuador?"

In my excitement I had forgotten that I was supposed to be from Los Angeles.

"Gregory Molina," I temporized quickly. "He told me was born in Ecuador."

By the time we were watching our second sunrise, nearly two hours later, I had melted into Spence's arms. I turned my face up to his, wanting him to kiss me.

He understood. He felt the same passion that I did.

But he said, very gently, "I'm a married man, Juanita."

"Do you love Bonnie Jo?"

"I used to. Now. . . ." He shook his head. In the light from the glowing Earth I could see how troubled and pained he was.

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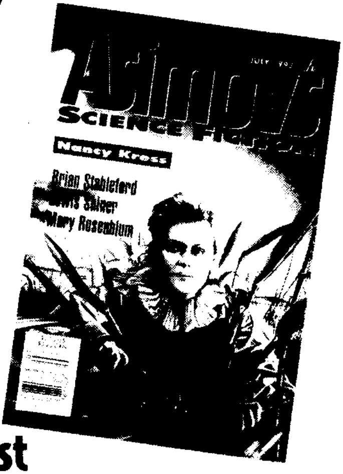

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"I love you, Spence," I told him.

He smiled sadly. "Maybe you think you do, but it isn't a smart move. I wouldn't be very good for you, kid."

"I know my own heart," I insisted.

"Don't make it any tougher than it has to be, Juanita. I'm old enough to be your father and I'm married. Not happily, true enough, but that's my fault as much as Bonnie Jo's."

"I could make you happy."

"You shouldn't be getting yourself involved with old married men. Pay some attention to guys your own age, like Greg."

"Molina? That . . . that would-be revolutionary?"

He looked totally surprised. "Revolutionary? What are you talking about?"

"Nothing," I snapped. "Nothing at all."

The mood was shattered, the spell broken. I had confessed my love to Spence and he had treated me like a lovesick child.

"We'd better leave," I said coldly.

"Yeah," Spence said. "We could both use some sleep."

But I did not sleep. Not at all. I seethed with anger all night. Spence had not only rejected me, he had belittled me. He did not see me as a desirable woman; he thought of me as a child to be lectured, to be palmed off on some young puppy-dog whose only passion is to avenge his miserable family's supposed honor.

What a fool I had been! I did not love Spence. I hated him! I spent the whole night telling myself so.

When we boarded the Clipper for the return flight to Florida, Sam was not with us.

"Where is he?" I asked Spence.

"He left a message. Went off to visit a buddy of his in the old Mac Dac Shack."

"The what?"

"One of the smaller stations. It's a medical center now."

"Sam needs medical attention?"

Spence broke into a grin. "Maybe after last night he does, after all."

I did not find that funny.

Sam did not appear at the office until three days later, and when he did finally show up he was grinning like a cat who had feasted on canaries.

He breezed into the mission control center while I was monitoring our latest repair mission. Gregory Molina sat in the left-hand chair, busily removing a set of computer boards that had to be replaced with upgrades.

"I've got everything lined up for the hotel," Sam announced loudly, plopping himself into the chair on my right.

"Congratulations," I said.

"Yep. Finally got Rockledge to agree to a reasonable leasing fee. Got my buddy Omar set to handle the logistics up in orbit. Contractors, a personnel outfit to hire the staff—everything's in place."

He smiled contentedly and leaned back in the little swivel chair. "All I need is the money."

I had to smile at him. "That would seem to me to be a major consideration."

"Nah." Sam waved an arm in the air. "I'll get the board to approve it at the next stockholder's meeting. That's only six weeks away."

He popped to his feet and strode confidently out of the center, whistling in his usual off-key fashion.

"Gringo imperialist," muttered Gregory Molina.

"You accept his paychecks," I taunted.

He gave me a dark look. "So do you."

"I don't call him names."

"No. But you don't need his money, do you? You live in a fine condo and drive a fancy sports car. Your clothing costs more than your salary."

"You've been spying on me.?"

He laughed bitterly. "No need for spying. You are as obvious as an elephant in a china shop."

"So my family has money," I said. "What of it?"

"You don't come from Los Angeles and you don't need this job, that's what of it. Why are you here?"

I could not answer. My brain froze in the laser beams of his dark eyes.

"Is it because you are Sam's mistress?"

"No!"

He smiled tightly. "But you are in love with Spence, aren't you?"

"No, I am not!"

"It's obvious," Gregory said.

"I *hate* him!"

"Yes," he said. "Anyone can see that."

The annual stockholder's meeting took place six weeks later. In that time I had become quite expert at running the mission control board. During my first weeks on the job I merely sat alongside Gene Redding and watched how he handled the job. Within two weeks he was allowing me to take over when he took a break. Within a month we were sharing the duty on long, ten and even twelve-hour shifts.

Sam needed more mission controllers because the volume of work was increasing rapidly. As he had predicted, the money was beginning to pour in to VCI. The ability to repair malfunctioning commsats and to replenish the fuel they used for their attitude-control thrusters suddenly made VCI a major force in the communications satellite industry. Instead of replacing aging commsats the corporations could get VCI to refurbish them, at a fraction of the replacement cost.

Spence worked closely with us, handling most of the remotely-controlled missions himself, operating the unmanned OTVs that now ran regular repair-and-refurbishment missions to GEO.

Sam practically danced with joy. "I'll be able to declare a dividend for the stockholders," he told us, "and *still* have a wad of moolah to get the hotel started."

Bonnie Jo frowned at him. "We could give the stockholders a bigger dividend if you'd forget about your orbital sex palace."

Sam laughed. "Are you kidding? My hotel's gonna be the biggest moneymaker you've ever seen in space. I've even got an advertising motto for it: 'If you like water beds, you're gonna *love* zero-*g*!' "

Bonnie Jo huffed.

Spence spent more time in the simulator than at home with Bonnie Jo. Sam was frugal when it came to hiring more staff; he might take on a very junior computer programmer from Los Angeles, but astronauts and mission controllers carried much higher price tags, and he refrained from hiring them. We worked extremely long hours, and Sam himself "flew" many of the remote missions; Spence did the rest of them—more than Sam did, by actual count.

It seemed to me that Spence was glad of the excuse to spend so much time away from his wife. Anyone could sense that their marriage was ripping apart. It made me sad to see him so unhappy, and I had to remind myself often that he had treated me like a schoolgirl and I hated him. For her part, Bonnie Jo seemed perfectly content to have Spence spend most of his time on the remote missions. She herself began to fly back to Salt Lake City every weekend.

Naturally, with my duties as the second mission controller and his as principal operator of the remote satellite repairs, we were together quite a bit.

Well, not together in the physical sense, precisely. Spence was in another room, some twenty meters down the hall from my mission control desk. But somehow, when I was not on duty, I often found myself walking down that hallway to watch him at work. He sat in an astronaut's contoured couch, his hands covered with metallic gloves that trailed hair-thin fiber optic cables, the top half of his handsome face covered by the stereo screens that showed him what the OTV's cameras were seeing.

I told myself that I was studying his moves, learning how to sabotage the repair missions. When the time came I would strike without mercy. When I was not hanging by the doorway to the remote manipulator lab, studying him like an avenging angel, I was at my mission control console, actually speaking with Spence, connected electronically to him, closer to him than anyone else in the world. Including his wife. I wanted to be close to him; that made it easier to find a way to sabotage his work, his company, his life.

"You planning to attend the stockholders' meeting?" Spence asked me, during a lull in one of the missions.

I was startled that he asked a personal question. "Say again?" I asked, in the professional jargon of a mission controller.

Spence chuckled. "It's OK, Juanita. The OTV's still in coast mode. It'll be another hour before we have to get to work. Loosen up."

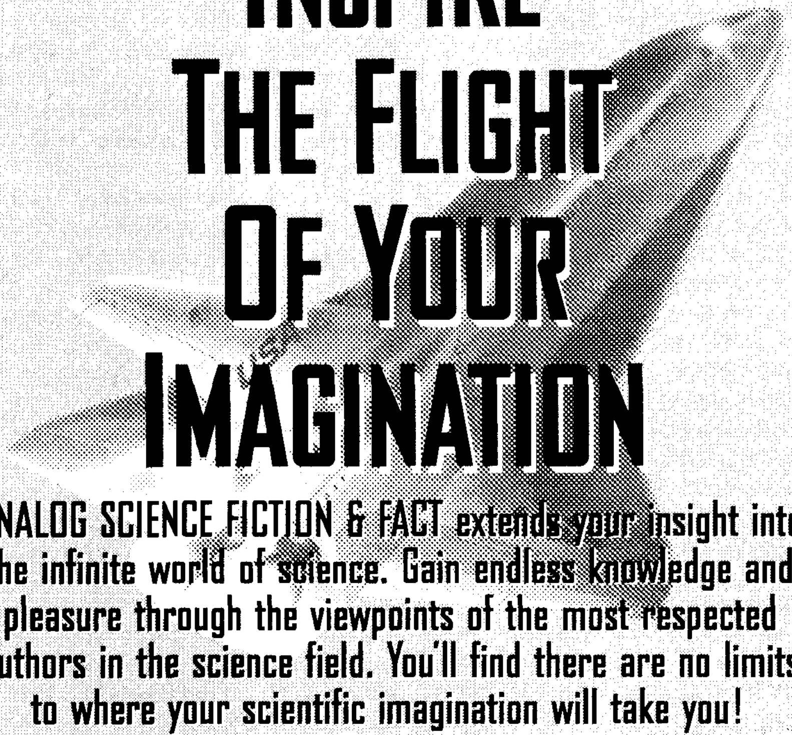
"Oh. Yes. Of course."

"You bought some stock, didn't you?"

"A few shares," I said. In actuality I was spending my entire salary on shares of VCI. If there had been a way to buy up all the existing shares I would have done it, using my father's treasury to deliver the company into his hands.

As fate would have it, the annual stockholder's meeting took place on the same day that my father gave his famous speech at the United Nations.

He told me about the speech the



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night before the meeting. As usual, I had driven to the consulate late at night and called him on the videophone. At least he had the good sense to receive my calls in his office, when he knew I was going to contact him.

My father was glowing with pride. His smile was brilliant, the shoulders of his suit wider than ever. He had even faced the necessity of replacing his thinning hair. Although his new mane of curly brown hair looked as if it had been stolen from a teenaged rock star, it was so wild and thick, it obviously made him feel younger and more vigorous.

"With Brazil in the chair at the Security Council and the Committee of the Twelve Equatorial Nations lining up support among the small nations in the General Assembly, I have high hopes for our cause."

"And your speech?" I asked him. "What will you say?"

His smile became even wider, even more radiant. "You must watch me on television, little one. I want you to be just as surprised as the rest of the world will be."

He would tell me no more. I, of course, reported in full to him about VCI's continuing success in repairing and refurbishing satellites remotely. And of the growing strains in the company's management.

"You still have the capability of destroying their spacecraft?" he asked me.

"Yes," I replied, thinking of how much damage I could do to Spence.

"Good," said my father. "The time is fast approaching when we will strike."

"Will it be necessary—"

But his attention was suddenly pulled away from me. I heard an aide shouting breathlessly at him, "The rebels have ambushed General Quintana's brigade!"

"Ambushed?" my father snapped, his eyes no longer looking at me. "Where? When?"

"In the mountains of Azuya, south of Cuenca. The general has been captured and his troops are fleeing for their lives!"

My father's face went gray, then red with fury. He turned back to me. "Excuse me, daughter. I have urgent business to attend to."

"Go with God," I mumbled, feeling silly at using such an archaic phrase. But it was all I could think to say.

The rebels were very clever. They must have known that my father was scheduled to fly to New York to deliver his speech to the United Nations. Now he either had to cancel his speech and admit to the world that his nation was in the throes of a serious internal conflict, or go to New York and leave his army leaderless for several days.

I could not sleep that night. When I arrived at the stockholders' meeting my eyes were red and puffy, my spirits low. How can I help my father? I kept asking myself. What can I do? He had sent me here to help him triumph over Sam Gunn and these other Gringos. But he was being threatened at home and I was thousands of kilometers away from him. I felt miserable and stupid and helpless.

Spence noticed my misery.

More than a hundred people were filing into the room in the big hotel where the stockholders' meeting was being held. Employees and their spouses, all ages, all colors. Blacks and Hispanics and Asians, women and men, Sam had brought together every variety of the human species in his company. He hired for competence; VCI was truly a company without prejudice of any kind. Except that it helped if you were female and young and attractive. That was Sam's one obvious weakness.

Out of that throng Spence noticed me. He made his way through the crowd that was milling around the coffee and doughnuts and came to my side.

"What's the matter, Juanita?"

I looked up into his clear blue eyes and saw that he too was sad-faced.

"Family problems," I muttered. "Back home."

He nodded grimly. "Me too."

"Oh?"

Before he could say more, Sam's voice cut through the hubbub of conversations. "OK, let's get this show on the road. Where's our noble president? Hey, Spence, you silver-haired devil, come on up here and preside, for god's sake, will ya?"

Spence lifted my chin a centimeter and gave me a forced grin. "Time to go to work," he said. Then he turned and almost sprinted up to the front of the room and jumped up onto the makeshift dais.

Sam, Bonnie Jo, and two other men flanked Spence at the long table set up on the dais. The board of directors, I realized. Each of them had a microphone and a name card in front of them. I was fairly certain that the older of the two strangers—Eli G. Murtchison—was Bonnie Jo's father.

There were two mammoth television sets on either side of the dais, as well. I wondered if the hotel kept them there all the time, or if they had been brought in for some specific reason.

The rest of us took the folding plastic chairs that the hotel had set along the floor of the meeting room. They were hard and uncomfortable: a stimulus to keep the meeting short, I thought. The meeting began with formalities. Spence asked that the minutes of the last meeting be accepted. Bonnie Jo read her treasurer's report so fast that I could not understand a word of it.

Then Sam, as chairman of the board, began his review of the year's business and plans for the coming year.

I could feel the tension in the air. Even as Sam spoke glowingly to the stockholders about VCI's new capabilities in remote satellite repair, even while they loudly applauded his announcement of a dividend, the room seemed to crackle with electricity.

And all the while I wondered where my father was, what he was doing, what decisions he was making.

A stockholder—Gene Redding, of all people—rose to ask a question. "Uh, Sam, uh, why isn't our dividend bigger, if we're, uh, making such good profits now?"

I turned in my chair to see Gene better. He was standing: portly, bald, looking slightly flustered. I had never before seen him in a suit and tie; he had always worn jeans and sports shirts at the office. But his suit was rumpled and his tie hung loosely from his unbuttoned shirt. It seemed to me that he felt guilty about asking his question. He was on Bonnie Jo's side, I realized.

Sam said tightly, "We have always plowed our profits back into the company, to assure our growth. This year the profits have been big enough to allow a dividend. But we are still plowing some of the profits back into growth."

Gene got red in the face, but he found the strength to ask, "Back into the growth of VCI's existing projects, or, uh, some other program?"

Sam shot a glance along the head table toward Bonnie Jo. Then he grinned at Gene. "You can sit down, Gene. This is gonna take some time, I can see that."

Bonnie Jo said, "Sam wants to put our profits—*your* profits—into building an orbital tourist hotel."

"A honeymoon hotel," Sam corrected.

A few chuckles arose from the stockholders.

"And we don't have to build it," Sam added. "We can lease space aboard Alpha from Rockledge International."

"Didn't you try that once before, when Global Technology first built Space Station Alpha?" asked another stockholder, a woman I did not recognize.

"And it didn't work out?" asked another.

"You went broke on that deal, didn't you?" still another asked. I realized that Bonnie Jo had recruited her troops carefully.

"Yeah, yeah," Sam answered impatiently. "That was years ago. Rockledge has taken over Alpha now and they're looking for customers to lease space."

"Under what terms?" Bonnie Jo asked.

"It's a bargain," said Sam enthusiastically. "A steal!"

I looked at Spence, sitting between Sam and Bonnie Jo. His face was a mask, his usual smile gone, his features frozen as if he wished to betray not even the slightest sign of emotion or partisan bias.

Gene Redding rose to his feet once again. I could see that his hands were trembling, he was so nervous.

"I . . . " he cleared his throat, "I want to make a, uh, a motion."

Spence said grimly, "Go ahead."

"I move . . . that the board of directors . . . " he seemed to be reciting a memorized speech, "refuse to allocate, uh, any monies . . . for any programs . . . not directly associated with VCI's existing lines of business." Gene said the last words in a rush, then immediately sat down.

"Second!" cried Bonnie Jo.

Spence stared at the back wall of the meeting room as he said automatically, "Movement made and seconded. Discussion?"

I had expected Sam to jump up on the table and do a war dance. Or at least to rant and scream and argue until we all dropped from exhaustion. Instead, he glanced at his wristwatch and said: "Let's postpone the discussion for a bit. There's a speech coming up at the UN that we should all take a look at."

Spence agreed to Sam's suggestion so quickly that I knew the two of them had talked it over beforehand. Bonnie Jo looked surprised, nettled, but her father laid a hand on her arm and she refrained from objecting.

The UN speech was by my father, of course, although no one in the room knew that I was the daughter of Ecuador's *Presidente*. I felt a surge of pride when his handsome face appeared on the giant TV screens. If only his new hair had matched his face better! He wore a civilian's business suit of dark blue, with the red sash of his office slanting across his chest. He looked bigger than normal, his chest broader and deeper. I realized he must have been wearing a bullet-proof vest. Was he worried that the rebels would try to assassinate him? Or merely wary of New York?

My father's speech was marvelous, although I had to listen to the English translation instead of hearing his dramatic, flowery Spanish. Still, it was dramatic enough. My father explained the legal origins of our claim to the equatorial orbit, the injustice of the rich corporations who refused to share their wealth with the orbit's rightful owners, and the complicity of the United Nations for allowing this terrible situation to persist.

I sat in my hard little folding chair and basked in the glow of my father's unassailable logic and undeterrable drive.

"Is there no one to help us?" he asked rhetorically, raising his hands in supplication. "Cannot all the apparatus of international law come to the aid of the Twelve Nations who have seen their territory invaded and usurped? Will no one support the Declaration of Quito?"

Suddenly his face hardened. His hands balled into fists. "Very well, then! The Twelve Equatorial Nations will defend their sacred territory by themselves, if necessary. I serve notice, on behalf of the Twelve Equatorial Nations, that the equatorial orbit belongs to *us,* and to no other nation, corporation, or entity. We are preparing to send an international team of astronauts to establish permanent residence in the equatorial orbit. Once there, they will dismantle or otherwise destroy the satellites that the invaders have placed in our territory."

The audience in the UN chamber gasped. So did we, in the hotel's meeting room. I felt a thrill of hot blood race through me.

"We will defend our territory against the aggressors who have invaded it," my father declared. "If this means war, then so be it. To do anything less would be to bow to the forces of imperialism!"

The people around me stared at one another, stunned into silence.

All except Sam, who yelled, "Jesus H. Christ on a motorcycle!"

As the TV picture winked off, one of the stockholders shouted, "What the hell are we going to do about *that?*"

All sense of order in our meeting

room dissolved. Everyone seemed to talk at once. Spence rapped his knuckles on the table but no one paid any attention to him. The argument about Sam's orbital hotel was forgotten. My father had turned our meeting into chaos.

Until Sam jumped up on the table and waved his arms excitedly. "Shut the hell up and listen to me!" he bellowed.

The room silenced. All eyes turned to the pudgy rust-haired elf standing on the head table.

"We're gonna get there before they do," Sam told us. "We're gonna put a person up there in GEO before they can and we're gonna claim the orbit for ourselves. They wanna play legal games, we can play 'em too. Faster and better!"

Spence objected, "Sam, nobody can stay in GEO for long. It's in the middle of the outer Van Allen belt, for gosh sakes."

"Pull a couple of OTVs together, fill the extra propellant tanks with water. That'll provide enough shielding for a week or so."

"How do you know? We've got to do some calculations, check with the experts—"

"No time for that," Sam snapped. "We're in a race, a land rush, we gotta go *now*. Do the calculations afterward. Right now the vital thing is to get somebody parked up there in GEO before those greedy sonsofbitches get there!"

"But who would be nuts enough to—"

"I'll do it," Sam said, as if he had made up his mind even before Spence asked the question. "Let's get busy!"

That broke up our meeting, of course. Spence officially called for an adjournment until a time to be decided. Everyone raced for their cars and drove pell-mell back to the office. Except for Sam and Spence, who jumped into Spence's convertible Mustang and headed off toward Cape Canaveral.

Despite my feelings of patriotism and love of my father, I felt thrilled. It was tremendously exciting to dash into the mission control center and begin preparations for launching Sam to GEO. Spence went with him as far as Space Station Alpha. Together they hopped up to the station where our OTVs were garaged on the next available Delta Clipper, scarcely thirty-six hours after my father's speech.

Even Bonnie Jo caught the wave of enthusiasm. She came into the control center as Sam and Spence were preparing the two OTVs for Sam's mission. It was night; I was running the board, giving Gene a rest after he had put in twelve hours straight. Bonnie Jo slid into the chair beside me and asked me to connect her with Sam, up at Alpha.

"We've been monitoring the Brazilian launch facility," she said, once Sam's round, freckled face appeared on the screen. "They're counting down a manned launch. They claim it's just a scientific research team going up to the *Nôvo Brasil* space station. But get this, Sam: the Brazilians are also counting down an unmanned launch."

"With what payload?"

"An old storm cellar that the U.S. government auctioned off five years ago."

"A what?"

"A shielded habitat module, like the one the scientists used on their first Mars missions to protect themselves from solar flare radiation," Bonnie Jo said.

Sam looked tired and grim. "They ain't going to Mars."

"According to the flight plan they filed, they're merely going to the Brazilian space station."

"My ass. They're heading for GEO."

"Can you get there first?" Bonnie Jo asked.

He nodded. "Got the second OTV's tanks filled with water. Rockledge bastards charged us two arms and a leg for it, but the tanks are filled. Spence is out on EVA now, rigging an extra propulsion unit to the tanker."

"Where did you get an extra propulsion unit?"

"Cannibalized from a third OTV."

Bonnie Jo tried not to, but she frowned. "That's three OTVs used for this mission. We only have two left for our regular work."

"There won't be any regular work if we don't get to GEO and establish our claim."

Her frown melted into a tight little smile. "I think I can help you there."

"How?"

"The Brazilians haven't filed an official flight plan with the IAA safety board."

The International Astronautical Administration had legal authority over all flights in space.

"Hell, neither have we," said Sam.

"Yes, but you didn't have that fatheaded Ecuadorian spouting off about sending a team to occupy GEO."

Fatheaded Ecuadorian! I almost slapped her. But I held on to my soaring temper. There was much to be learned from her, and I was a spy, after all.

Sam was muttering, "I don't see what—"

With a smug, self-satisfied smile, Bonnie Jo explained, "I just asked my uncle, the senator from Utah, to request that our space agency people ask the IAA if they've inspected the Brazilian spacecraft to see if it's properly fitted out for long-term exposure to high radiation levels."

Sam grinned back at her. "You're setting the lawyers on them!"

"The safety experts," corrected Bonnie Jo.

"Son of a bitch. That's great!"

Bonnie Jo's smile shrank. "But you'd better get your butt off the space station and on your way to GEO before the IAA figures out what you're up to."

"We'll be ready to go in two shakes of a sperm cell's tail," Sam replied happily.

If Bonnie Jo was worried about Sam's safety up there in the Van Allen radiation, she gave no indication of it. I must confess that I felt a twinge of relief that it was Sam who was risking himself, not Spence. But still I smoldered at Bonnie Jo's insulting words about my father.

And suddenly I realized that I had to tell Papa about her scheme to delay the Brazilian mission. But how? I was stuck here in the mission control center until eight

I could risk a telephone call, I thought. Later, in the dead of night, when there was little chance of anyone else hanging around.

The hours dragged by slowly. At midnight Molina and another technician were in the center with me, helping Sam and Spence check out their jury-rigged OTV prior to launch. By one-thirty they were almost ready to start the countdown.

I found myself holding my breath as I watched Sam and Spence go through the final inspection of the OTV, both of them encased in bulky space suits as they floated around the ungainly spacecraft, checking every strut and tank and electrical connection. Their suits had once been white, I suppose, but long use had turned them both dingy gray. Over his years in space Sam had brightened his with decorative patches and pins, but they too were frayed and faded. I could barely read the patch just about his name stencil. It said, *The meek shall inherit the Earth. The rest of us are going to the stars.*

"Hey, Esmeralda," Sam called to me, "why don't you come up here with me? It's gonna be awful lonesome up there all by myself."

"Pay attention to your inspection," I told him.

But Sam was undeterred, of course. "We could practice different positions for my zero-g hotel."

"Never in a million years," I said.

He grinned and said, "I'll wait."

At last the inspection was finished and we finally began the final countdown. I cleared my display screen of the TV transmission from Alpha and set up the OTV's interior readouts. For the next half-hour I concentrated every molecule of my attention on the countdown. A man could be killed by the slightest mistake now.

A part of my mind was saying, so what if Sam was killed? That would stop his mission to GEO and give your father the chance he needs to triumph. But I told myself that my father would not condone murder or even a political assassination. He would triumph and keep his hands clean. And mine. It was one thing to tinker with a computer program so that an unmanned spacecraft would be destroyed. I was not a murderer and neither was my father. Or so I told myself.

"Thirty seconds," said Gregory Molina, sitting on my left.

Sam had become very quiet. Was he nervous? I wondered. I certainly was. My hands were sweaty as I stared at the readouts on my display screen.

"Fifteen seconds."

Everything seemed right. All systems functioning normally. All the readouts on my screen in the green.

"Separation," the tech announced.

The launch was not dramatic. I cleared my display screen for a moment and switched to a view from one of the space station's outside cameras and saw Sam's ungainly conglomeration move away, without so much as a puff of smoke, and dwindle into the star-filled darkness.

I felt inexpressibly sad. He was my enemy, the sworn foe of my people. I should have hated Sam Gunn. Yet, as he flew off into the unknown dangers of living in the radiation belt for who-knew how long, I did not feel hatred for him. Admiration, perhaps. Respect for his courage, certainly.

Suddenly I blew him a kiss. To my shock, I found that I actually *liked* Sam Gunn.

"It's a good thing he couldn't see that," Gregory growled at me. "He would turn the OTV around and come to carry you off with him."

I leaned back in my chair, my head throbbing from the tension, glad that this Molina person was there to remind me of my true responsibilities.

"Sam is a rogue," I said loftily. "One can admire a rogue without being captivated by him."

Gregory snorted his disdain and got up from his chair, leaving me alone in the control center.

I waited until almost dawn before daring to phone my father. The mission was going as planned: Sam was coasting out to GEO, all systems were within nominal parameters, there was nothing for anyone to do. We had not even chatted back and forth since the launch; there was no need to, although I found myself wondering if Sam was so worried about his brash jaunt into the radiation dangers of GEO that he had finally lost the glibness of his tongue.

Somewhere a band of university scientists that Spence had hired as consultants were figuring out how long Sam could remain in GEO safely. Molina and the other technicians went home. Other technicians came in and sat on either side of me. After an hour of nothing to do, I told them to take a break, take a nap if they liked. I could monitor the controls by myself. I promised to call them if I needed them.

I phoned my father, instead. He was still in New York, where he planned to wait for the success of the Brazilian mission. I woke him, of course, but at least this time he was alone in his bed. Or so it seemed.

"He is already on his way?" My father's sleepy eyes opened wide once I told him about Sam.

"Yes," I said. "And the United States is asking the IAA to make a safety investigation of the Brazilian spacecraft."

He seemed confused by that.

"It will delay the Brazilian mission for days!" I hissed, not daring to raise my voice. "Sam will be in GEO and claim the territory before they even get off the space station."

My father lapsed into a long string of heartfelt curses so foul that even today I blush at the memory.

He raged at me, "And what have you done about it? Nothing!"

"There is nothing I can do, Papa."

"Bah! I am surrounded by traitors and incompetents! My own daughter cannot raise a finger to help me."

"But Papa—"

"Do you realize what this Gringo is doing? He is turning our own position against us! He is using my speech as a pretext for taking the equatorial orbit away from us! I will look like a fool! Before the United Nations, before the news media, before the whole world—I will be made to appear like a fool!"

I was shocked and saddened to realize that my father's concern was not for his people or for the injustice of the situation. His first concern was about his own image.

"But Papa," I asked tearfully, "what can we do about it?"

"You must act!" he said. "You said you were prepared to sabotage their spacecraft. Now is the time to do it. Strike! Strike now!"

I stared at his image in horror. My father's face was contorted with fury and hate.

"Kill that Gringo bastard!" he snarled at me. "He must never reach the equatorial orbit alive."

The bug that I had inserted into the mission control program merely allowed me to fire an OTV's thrusters when I chose to. Originally I had thought that I could send an unmanned OTV crashing into a communications satellite; a neat piece of sabotage.

Sam was not planning to park his spacecraft close enough to a commsat for my plan to work, however. He merely wanted to establish himself in GEO long enough to make the territorial claim that my father wanted for the Twelve—and for the UN to recognize that claim.

I could not send him crashing into a satellite, I realized. But what if I used my bug to fire his thrusters as he approached GEO? He would go careening past the orbit, farther out into space. His trajectory would undoubtedly carry him into a wildly looping orbit that would either fling him into deep space forever, or send him hurtling back toward the Earth, to plunge into the atmosphere and burn up like a meteor.

Yes, I told myself, I could kill Sam Gunn with the touch of a finger. I was alone in the mission control center. No one would see me do it. I could then erase the bug in the program and no one would ever know why Sam's thrusters misfired.

But—murder Sam? Only a few hours earlier I had been telling myself that my father was too good a man to stoop to murder. And now—

"They're going to assassinate him."

I whirled in my chair to see Gregory standing just inside the control center's doorway. His face was grim, his eyes red and sleepless.

"I thought you had gone home," I said.

"Didn't you hear me?" He stalked toward me, angry or frightened or both, I could not tell. "They're going to kill him! Assassinate him!"

"No . . . I can't. . . . " My voice choked in my throat.

"It's all set up," Gregory said, padding to the chair beside me like a hunting cat. "There's nothing you can do about it."

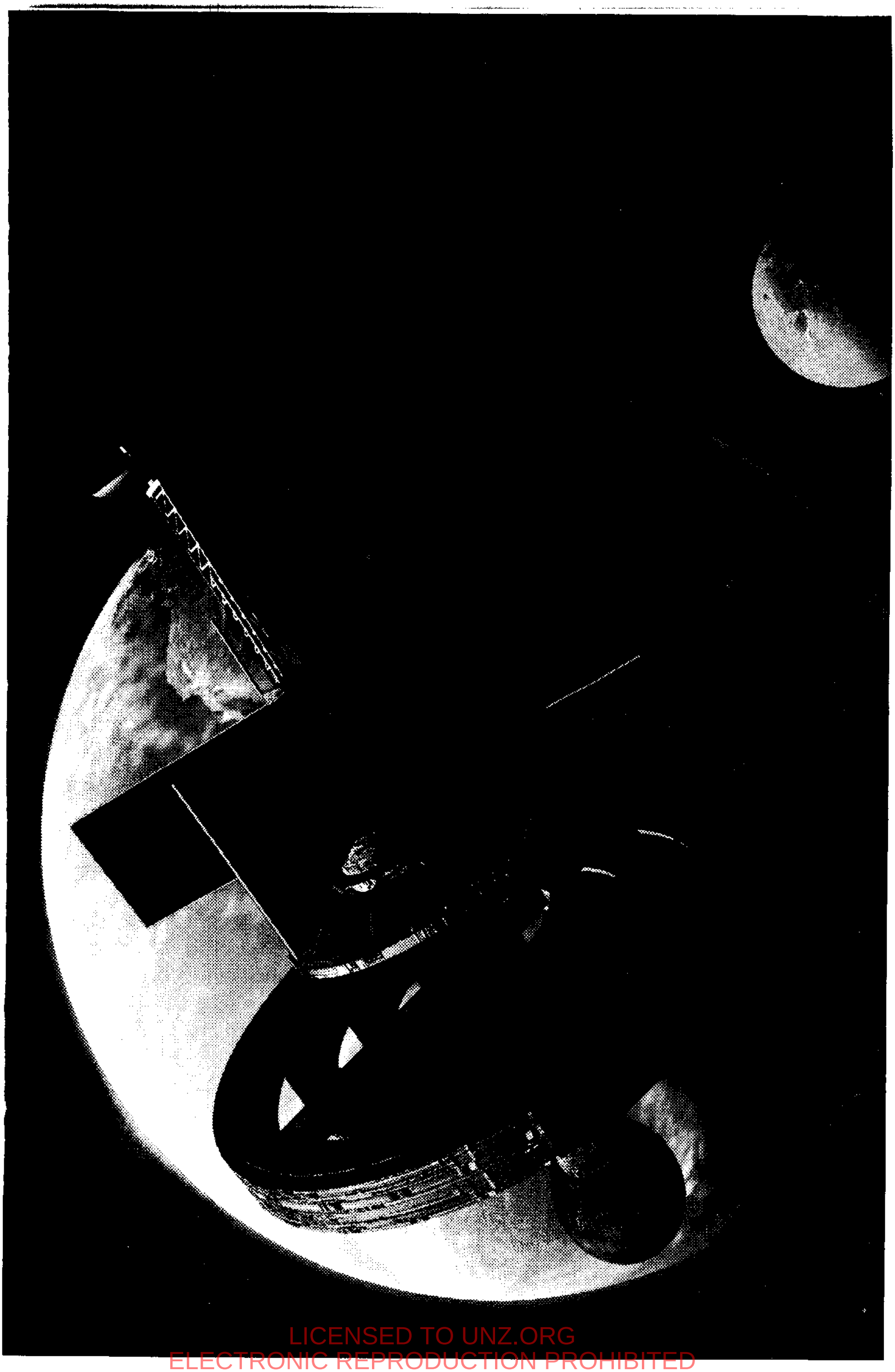
"I can't kill Sam," I said, nearly breaking into sobs.

"Sam?" Gregory's brows knit. "I'm not talking about Sam. It's your father. The rebels are going to assassinate him in New York."

"What? How do you know?"

"Because I'm one of them," he snapped. "I've been with them all along. And now I've been assigned to kidnap you."

"Kidnap me?" My voice sounded like a stranger's to me: pitched high



with surprise and fear. Yet inwardly I was not afraid. Shocked numb, perhaps, but not frightened.

Gregory's expression was unfathomable, but he seemed to be in torment. "Kidnap you," he repeated. "Or assassinate you if kidnapping becomes impossible."

"You wouldn't dare!"

He made a bitter, twisted smile. "This is our moment, princess. Your father is in New York, where we have enough people to get past his security team. You are his only living relative—or the only one he admits to. General Quintana is already storming the main army barracks in the capital."

"General Quintana? But he's—" The words choked in my mouth as I realized that Quintana was a traitor.

"He will be our next president," Gregory said, then added, "he thinks."

I could feel my eyes widening.

Still with his twisted smile, Gregory explained, "Do you think we are fools enough to trust a traitor? Or to put a general in the president's chair?"

"No, I suppose you are not."

Gregory fell silent for a long moment, then he asked, "Will you allow me to kidnap you? It will be merely for long enough to keep you from warning your father."

"So that you can murder him."

"I didn't want them to do that. I thought we could overthrow him without bloodshed, but the others want to make certain that he won't be able to stop us."

I said nothing. I was desperately trying to think of something to do, some way to escape Gregory and warn my father.

"After we finish Sam's mission I'll have to take you with me." His expression changed. He seemed almost shy, embarrassed. "I promise you that you will not be harmed in any way. Unless you try to resist, of course."

"Of course," I snapped.

He pointed to my display screen. "It's almost time for you to activate your bug."

"You know about that?"

"Of course I know about it," he said. "I have been watching you very closely since the first day you came here, pretending to be from Los Angeles."

My heart sank. I had not fooled him for a moment. Yet, somehow, I was forced to admire how clever Gregory had been, even though he was my enemy. Or rather, my father's enemy.

"It will be a shame to kill Sam," he said, with real regret in his voice. "Maybe his trajectory will bring him close enough to one of the space stations so that somebody can rescue him."

"Not much chance of that," I said.

He shrugged. Unhappily, I thought. "It must be done. We can't allow Sam to claim the equatorial orbit."

"So your glorious rebels want the orbit for themselves," I taunted.

"Yes! Why not? It is the one chance that a poor nation such as Ecuador has to gain some of the wealth these corporations are making in space."

"So you will kill Sam as well as my father."

"No," he said grimly. "*You* will kill

Sam."

At that instant Spence's voice came through the radio receiver, "Preparing for OIB."

Spence's voice. Not Sam's.

Greg looked surprised. I felt a flame of shock race through me. I whirled my chair back to the console and toggled the radio switch.

"Spence! Where are you?"

"Aboard the OTV, Juanita honey. Sam got a brilliant idea at the last minute and we switched places."

"Where is Sam?"

"He ought to be in New York by now."

"New York?" we both said in unison.

"Yeah. Anyway, I'm five minutes away from OIB. You copy?"

Orbital insertion burn. The final firing of the OTV's thrusters to place the spacecraft in the geosynchronous orbit. The time when my bug would make the thrusters fire much longer than they should and fling the craft into a wild orbit that would undoubtedly kill its pilot.

But the pilot was Spence! I had found it troubling to think of killing Sam, but it was Spence inside that OTV! No matter how angry I was with him, not matter how much I told myself I hated him, I could not knowingly, willingly, send him to his death.

"For what it's worth," Spence reported cheerfully, "the radiation monitors in this ol' tin can show everything's in the green. Radiation's building up outside, but the shielding's protecting me just fine. So far."

I turned from the display screen to Greg. His face looked awful.

"I can't do it," I whispered. "I can't kill him."

He reached out his hand toward my keyboard, then let it drop to his side. "Neither can I."

"OIB in three minutes," Spence's voice called out. "You copy?"

I looked at the mission time-line clock as I flicked the radio switch again. "We copy OIB in two minutes, fifty-six seconds."

Greg sank down onto the chair next to me, his head drooping. "Some revolutionary," he muttered.

"Let me warn my father," I pleaded. "You don't want his blood on your hands."

"No," he said, shaking his head stubbornly. "I can't go that far."

"But Sam will be with him, don't you understand?"

"Sam? Why would—"

"Sam went to New York! That's what Spence told us. The only reason for Sam to go to New York is to see my father. Sam will be in the line of fire when your assassins strike. They'll kill him too!"

Greg looked miserable, but he said in a hoarse croak, "That can't be helped. There's nothing I can do."

"Well, I can," I said, reaching for the telephone.

"Don't!"

"What will you do? Kill me?"

He grabbed my arm. I tried to pull free but he was stronger. I struggled but he held me in his powerful arms and pulled me to him and kissed me. Before I realized what I was doing I was kissing him, wildly, passionately, with all the heat of a jungle beast.

At last Greg pulled loose. He stared into my eyes for a long, timeless moment, then said, "Yes. Call your father. Warn him. I can't be a party to murder. It's one thing to talk about it, plan for it. But I just can't go through with it."

"OIB in one minute," Spence's voice chirped.

"Copy OIB in fifty-nine seconds," I said as I took up the telephone. My eyes were still on Greg. He smiled at me, the sad smile of a man who has given up everything. For me.

"You are not a killer," I said to him. "That is nothing to be ashamed of."

"But the revolution—"

"To hell with the revolution and all politics!" I snapped as I tapped out the number for my father's hotel room.

"We are sorry," said a computer-synthesized voice, "but the number you have called is not in service at this time."

Cold terror gripped my heart.

I called the hotel's main number. It was busy. For half an hour, while Spence's OTV settled into its equatorial orbit and he read off all the radiation monitors inside and outside the spacecraft, the hotel's main switchboard gave nothing but a busy signal.

I was ready to scream when Greg suddenly bolted from the control center and came back a moment later with a hand-sized portable TV. He turned it to the all-news channel.

"... Hostage situation," said a trench-coated reporter standing in front of a soaring hotel tower. It was drizzling in New York but a huge throng had already gathered out on the streets.

"Is the president of Venezuela still in there?" asked an unseen anchor woman.

"It's the president of Ecuador, Maureen," said the reporter on the street. "And, yes, as far as we know he's still in his suite with the gunmen who broke in about an hour ago."

"Do you know who's in there with him?"

The reporter, bareheaded in the chilly drizzle, squinted into the camera. "A couple of members of his staff. The gunmen let all the women in the suite go free about half an hour ago. And there is apparently an American businessman in there, too. The hotel security director has identified the American as Sam Gunn, from Orlando, Florida."

"How could the rebels get past my father's security guards?" I wondered out loud.

"Bribes," said Greg. He spoke the word as if it were a loathsome thing. "Some men will sell their souls for money."

I told Spence what was happening, of course. He seemed strangely nonchalant.

"Sam's been in fixes like this before. He always talks his way out of 'em."

He was trying to keep my spirits up, I thought. "But these men are killers!" I said. "Assassins."

"If they haven't shot anybody yet, the chances are they won't. Unless the New York cops get trigger-happy."

That was not very encouraging.

"For what it's worth," Spence added, "the radiation monitors inside my cabin are still in the green."

We had not had time to link the radiation monitors to the telemetry system, so there was no readout for them on my console.

"Maybe you could pipe the television news up to me," he suggested. "I've got nothing else to do for a stretch."

I did that. We watched the tiny television screen until Gene Redding and his assistants showed up at eight A.M. A murky morning was breaking through the clouds in New York. I thought about hiring a jet plane to fly up there, but realized it would do no good. The hostage crisis dragged on, with the hotel surrounded by police and no one entering or leaving the penthouse suite of my father.

All the employees of VCI were watching the TV scene by now. It seemed as if at least half of them were jammed into the mission control center. Gene Redding had taken over as controller; I had moved to the right-hand chair, a headset still clamped over my ear.

"Want to make a bet Sam talks them out of whatever they came for?" Spence asked me.

I shook my head, then realized that he could not see me. "No," I said. "Not even Sam could—"

"Wait a minute!" said the news reporter. Like the rest of us, he had been on the scene all night without relief. "Wait a minute! There seems to be some action up there!"

The camera zoomed up to the rooftop balcony of my father's suite. And there stood Sam, grinning from ear to ear, and my father next to him, also smiling—although he looked drawn and pale, tired to the point of exhaustion. Behind them, three of the rebel gunmen were pulling off their ski masks. They, too, were laughing.

I rented the fastest jet available at the Orlando airport and flew to New York. With Greg at my side.

By the time we reached my father's hotel suite the police and the crowds and even the news reporters had long since gone. Sam was perched on the edge of one of the big plush chairs in the sitting room, looking almost like a child playing in a grown-up's chair. He was still wearing the faded coveralls that he had put on for the space mission.

My father, elegantly relaxed in a silk maroon dressing gown and white silk ascot, lounged at his ease in the huge sofa placed at a right angle to Sam's chair. The coffee table before them was awash with papers.

My father was smoking a cigarette in a long ivory holder. He was just blowing a cloud of gray smoke up toward the ceiling when Greg and I burst into the room.

"Papa!" I cried.

He leaped to his feet and put the cigarette behind him like a guilty little boy. Sam laughed.

"Papa, are you all right?" I rushed across the room to him. Awkwardly, he balanced the long cigarette holder on the arm of the sofa as I flung my arms around his neck.

"I am unharmed," he announced calmly. "The rebels have gone back to Quito to form the new government."

"New government?"

"General Quintana will head the

provisional government," my father explained, "until new elections are held."

"Quintana?" I blurted. "The traitor?"

Greg's face clouded over. "The army will run the government and find excuses not to hold elections. It's an old story."

"What else could I do?" my father asked sadly.

Still seated in the oversized chair, Sam grinned up at us. "You didn't do too badly, Carlos, old buddy."

Sam Gunn, on a first-name basis with my father?

Getting to his feet, Sam said to me, "Meet the new co-owner of OrbHotel, Inc."

One shock after another. It took hours for me to get it all straight in my head. Gradually, as my father and Sam told me slightly conflicting stories, I began to put the picture together.

Sam had barged into my father's hotel suite just as the rebel assassination team had arrived, guns in hand.

"They had bribed two of my security guards," my father said grimly. "They just walked in through the front door of the suite, wearing those ridiculous ski masks."

Sam added, "They were so focused on your father and the other two guys in his security team that I walked in right behind them and they never even noticed. Some assassins. A trio of college kids with guns."

Once they realized that an American citizen was in the suite the student-assassins became confused. Sam, of course, immediately began bewildering them with a nonstop monologue about how rich they could become if they would merely listen to reason.

"They're all shareholders in my new corporation," Sam told us happily. "Sam Gunn Enterprises, Unlimited. Neat title, isn't it?"

"They refrained from assassinating my father in exchange for shares in a nonexistent corporation?" I asked.

"It'll exist!" Sam insisted. "It's going to be the holding company for all my other enterprises—VCI, OrbHotel, I got lots of other ideas, too, you know."

My father's face turned somber. "They did not settle merely for shares in Sam's company."

"Oh? What else?"

"I had to resign as president of Ecuador and name Quintana as head of the interim government."

"Until elections can be held," Greg added sarcastically.

"Who is this young man?" my father asked.

"I am Gregorio Esteban Horacio Molina y Diego, son of Professor Molina, who fled from your secret police the year you became president."

"Ah." My father sagged down onto the sofa and picked up his cigarette holder once again. "Then you want to murder me, too, I suppose."

"Papa, you're murdering yourself with those cigarettes!"

"No lectures today, little one," he said to me. Then he puffed deeply on his cigarette. "I have been through much these past twenty hours."

"Greg did not condone assassinating you," I told my father. "He wanted me to warn you." That was stretching the truth, of course, and I wondered why I said it. Until I took a look at Greg, so serious, so handsome, so brave.

For his part, Greg said, "So you have joined forces with this Gringo imperialist."

"Imperialist?" Sam laughed.

"I have invested my private monies in the orbital hotel project, yes," my father admitted.

"Drug money," Greg accused. "Cocaine money squeezed from the sweat of the poor farmers."

"We're going to make those farmers a lot richer," Sam said.

"Yes, of course." Greg looked as if he could murder them both.

"Listen to me, hothead," said Sam, jabbing a stubby finger in Greg's direction. "First of all, I'm no flogging imperialist."

"Then why have you claimed the equatorial orbit for yourself?"

"So that nobody else could claim it. I don't give a crap whether the UN recognizes our claim or not, I'm *giving* all rights to the orbit to the UN itself. That orbit belongs to the people of the world, not any nation or corporation."

"You're giving. . . ?"

"Yeah, sure. Why let the lawyers spend the next twenty years wrangling over the legalities? I claim the orbit, then voluntarily give up the claim to the people of the world, as represented by the United Nations. So there!" And Sam stuck his tongue out at Greg, like a self-satisfied little boy.

Before either of us could reply, Sam went on, "There's big money to be made in space, kids. VCI's just the beginning. OrbHotel's gonna be a winner, and with Carlos bankrolling it, I won't have to fight with VCI's stockholders for the start-up cash."

"And how are you going to make the farmers of Ecuador rich?" Greg asked, still belligerent.

Sam leaned back in the plush chair and clasped his hands behind his head. His grin became enormous.

"By making the government of Ecuador a partner in Sam Gunn Enterprises, Unlimited."

Greg's face went red with anger. "That will make Quintana rich, not the people!"

"Only if you let Quintana stay in office," Sam said smugly.

"A typical Gringo trick."

"Wait a minute. Think it out. Suppose I announce that I'm willing to make a *democratically elected* government of Ecuador a partner in my corporation? Won't that help you push Quintana out of power?"

"Yes, of course it would," I said.

Greg was not so enthusiastic. "It might help," he said warily. But then he added, "Even so, how can a partnership in your corporation make millions of poor farmers rich?"

"It won't make them poorer," replied Sam. "It may put only a few *sucres* into their pockets, but that'll make life a little sweeter for them, won't it?"

Sam had made a bilingual pun! I was impressed, even if Greg was not.

"And we'll be buying all our foodstuffs for OrbHotel from Ecuadorian producers, naturally," Sam went on.

"And I'll sell Ecuadorian produce to the other orbital facilities, too. Make a nice profit from it, I betcha. Sure, there's only a few hundred people living in orbit right now but that's gonna grow. There'll be thousands pretty soon, and once the Japanese start building their solar power satellites they're going to need food for a lot of workers."

Without seeming to draw a breath Sam went on, "Then there's the hotel training facility we're gonna build just outside Quito. We'll hire Ecuadorians preferentially, of course. Your father drove a hard bargain, believe me, Esmeralda."

He talked on and on until even Greg was at least halfway convinced that Sam would be good for the people of Ecuador.

It was growing dark before Sam finally said, "Why don't we find a good restaurant and celebrate our new partnership?"

I looked at Greg. He wavered.

So I said, for both of us. "Very well. Dinner tonight. But tomorrow Greg and I leave for Quito. We have much work to do if Quintana is to be prevented from cementing his hold on the government."

Sam smiled at us both. "You'll be going to Quito as representatives of Sam Gunn Enterprises, Unlimited. I don't want this Quintana character to think you're revolutionaries and get you kids into trouble."

"But we are revolutionaries," Greg insisted.

"I know," said Sam. "The best kind of revolutionaries. The kind that're really going to change things."

"Do you think we can?" I asked.

My father, surprisingly, said, "You must. The future depends on you."

"Don't look so gloomy, Carlos, old buddy," Sam said. "You've got to understand the big picture."

"The big picture?"

"Sure. There's money to be made in space. Lots of money."

"I understand that," said my father.

"Yeah, but you gotta understand the rest of it." And Sam looked squarely at Greg as he said, "The money is made in space. But it gets spent here on Earth."

My father brushed thoughtfully at his moustache with a fingertip. "I see."

"So let's spread it around and do some good."

Greg almost smiled. "But I think you will get more of the money than anyone else, won't you?"

Sam gave him a rueful look. "Yeah, that's right. And I'll spend it faster than anybody else, too."

So Greg and I returned to Ecuador. General Quintana reluctantly stepped aside and allowed elections. Democracy returned to Ecuador, although Greg claimed it arrived in our native land for the first time. Quintana retired gracefully, thanks to a huge bribe that Sam and my father provided.

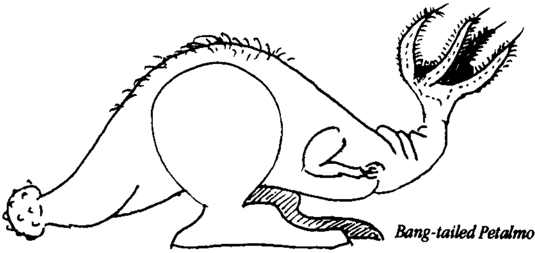
Spence and Bonnie Jo eventually were divorced, but that happened years later. By that time I had married Greg and he was a rising young politician who would one day be president of Ecuador himself. The country was slowly growing richer, thanks to its investment in space industries. Sam's orbital hotel was only the first step in the constantly-growing commerce in space.

I never saw Sam again. Not face-to-face. Naturally, we all saw him in the news broadcasts time and again. Just as he said, he spent every penny of the money he made on OrbHotel and went broke.

But that is another story. And *gracias a Dios,* it is a story that does not involve me. ■

## From the TRAVEL DIARY AND SKETCHBOOK OF BRAXTON MONTAGUE SHEW III

[*Throop & Sons, Marsport, Krasnya Rep. (2394 A.D.)*]



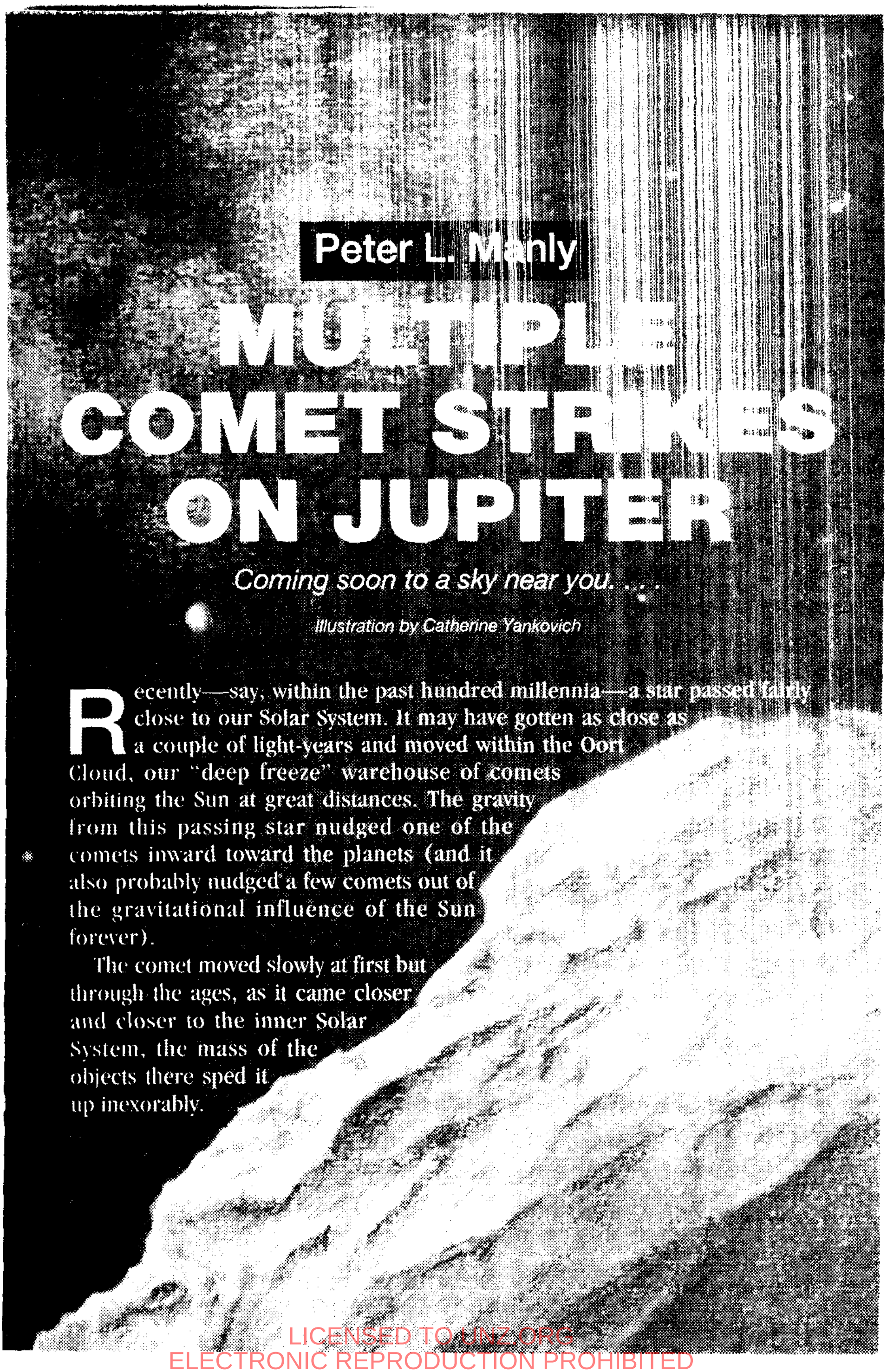
*Bang-tailed Petalmouth*

Dear Mater,

I hope this letter finds you and the Pater well. We have made planetfall on New Adelaide around Great Kelly's Star, a dreary, provincial place with very little to interest one. The local architecture is hideous, being mostly plasma-molded rock so that the buildings resemble nothing more than congealed oatmeal. And the "art," if one may call it by so exalted a term, consists of variously-stained, oily pastes applied to stretched sheets of canvas. Nevertheless, to pass the time before departure, Umberto, M'bwurto and I contracted with a "bushmaster," a colonial guide, to take us for a turn through the wild country south of the spaceport. While his hopper-skimmer seemed rather old, and appeared to have been constructed of odd bits and pieces of several models, it did serve its rugged purpose admirably. We managed a close-up look at the local behemoth, called a Bang-tailed Petalmouth, which I have rendered in the enclosed sketch. Bert, our bushmaster, informed us that the "petals" are precise sensors for light, sound and odor, and also serve as fingers to uproot grasses and other plants and stuff them down its maw. Because the beast orients itself to the sunlight as it moves along, it tends to graze in circular arcs. This is what gives the grasslands their distinctive moiré pattern when viewed from space. It has also made the local predators quite the little geometers.

With fondest regards,

your son,
Brax



Peter L. Manly

# MULTIPLE COMET STRIKES ON JUPITER

*Coming soon to a sky near you. . . .*

*Illustration by Catherine Yankovich*

Recently—say, within the past hundred millennia—a star passed fairly close to our Solar System. It may have gotten as close as a couple of light-years and moved within the Oort Cloud, our "deep freeze" warehouse of comets orbiting the Sun at great distances. The gravity from this passing star nudged one of the comets inward toward the planets (and it also probably nudged a few comets out of the gravitational influence of the Sun forever).

The comet moved slowly at first but through the ages, as it came closer and closer to the inner Solar System, the mass of the objects there sped it up inexorably.

It might have dived into the Sun or it might have rounded the local star and orbited back into the depths of space—comets do these things all the time. This particular comet, however, had a slightly different destiny. Within the outer Solar System, just as the feeble rays of the Sun started warming it, causing a faint tail of gas and dust to percolate off its surface and stream behind in the solar wind, the comet had a near encounter with a planet on 8 July 1992. Of all the planets it could encounter, this one was the most dangerous to comets, for it is the most massive: Jupiter.

The comet did not hit the planet, but the Jupiter passage altered the comet forever. First, Jupiter's massive gravitational pull skewed the comet's orbit and captured it in a highly elliptical path so that the comet now orbits Jupiter as another moon. Jupiter already has more than a dozen moons and a ring system so that makes it a fairly interesting place. So interesting, as a matter of fact, that the creatures on the third planet are sending a probe there called Galileo. The comet came within 120,000 km of the planet and while that may seem a long distance, realize that Jupiter has a radius of only about 70,000 km.

The comet encountered an effect within the Jovian system called the Roche Limit. We all know that when a body orbits a planet, the body "feels" as if it were in zero *g*. This is because the gravitational attraction of the planet provides just enough centripetal acceleration to offset the body's Newtonian tendency to fly off on a tangent, which it "feels" as a "centrifugal force." Thus, the body feels neither force. While this is true for small bodies, larger ones like a comet several kilometers in diameter experience a secondary effect. The part of the comet nearest Jupiter feels a slightly greater tug of gravity than the part farthest from Jupiter. This is simply because the force of gravity is proportional to the masses involved divided by the square of the distance between them. Now, comets are thought to be fairly rigid bodies composed of frozen gasses and dust. As such, they probably do not have a high tensile strength (they can be pulled apart easily). The differential tug of Jupiter's gravity from one part of the comet to the other acts like two forces in zero *g* which, if the comet passes within a distance called the Roche limit, will pull it apart.

Eventually, this comet did come apart into pieces; between thirteen and twenty of them depending on how carefully one looks for the smaller chunks. It is estimated that the comet's original size was about 9 km in diameter, which is fairly large for a comet (about the same size as Halley, a major comet). It may have been as small as 2 km. In the early fall of 1993 the Hubble Space Telescope looked at the pieces, and scientists analyzing the data estimated that each piece was on the order of 0.75 km in diameter, although they did not rule out a chunk as large as 4 km.

Each of these pieces became a separate comet in its own right, each trailing a tail of gas and dust as they slowly moved away from the other fragments. Then on the night of

24 March 1993 three of those creatures from the third planet finally became aware of the comet. Caroline and Eugene Shoemaker and David Levy spend several nights each month on the Palomar 0.5 meter diameter Schmidt camera looking for just such oddball objects, and this one did not escape them. Initially, it appeared to be just a single smudge on the film. After taking a confirmation photograph they notified the Central Bureau for Astronomical Telegrams at the Smithsonian Astrophysical Observatory. The director confirmed the position with another observatory and then broadcast the news of the discovery to the world via Internet and other media. Scientists have a penchant for naming things and so the comet became 1993e (the fifth comet discovered in 1993) and, as a second name, Comet Shoemaker-Levy. Eventually it would be called P/Shoemaker-Levy 9 (P for periodic and 9 for the ninth comet that the Shoemaker-Levy team has discovered). So far it appeared to be just another comet; it was interesting to cometary astronomers but no big deal.

When they looked at the comet with a larger telescope having much better resolving power, the comet became a puzzle, for it looked like a bar. If the bar were a bright tail, the tail was pointing in the wrong direction (comet tails always point away from the Sun). They applied more magnification and finally they realized that they had at least a dozen comets, all "flying formation" in a straight line. With high-resolution CCD television images, the individual tails could be discerned for each piece. The apparition, immediately dubbed a "string of pearls," is one of the more beautiful and unusual sights I have ever seen in the sky.

Immediately astronomers asked how such a comet could come to be. Comets move slowly and it took several days before enough precise position measurements could be made to calculate accurately the comets' present and past positions. The orbital trail pointed directly back to Jupiter. In fact, it soon became obvious that the comet no longer orbited the Sun but remained gravitationally bound to Jupiter itself with a period of about two years. News of these discoveries were broadcast to the astronomical community and interest in the new object picked up. The images appeared in the popular astronomy press. The discoverers found themselves granting interviews to the media. Comet Shoemaker-Levy was dubbed the Comet of the Century.

Then somebody asked the fatal question of how close the comet would come to Jupiter as it completed its first orbit around the planet. Perijove (the point of closest approach to the Jovian planet) would be less than the radius of the planet! In plain terms, the comet was going to hit the planet. This is a sobering thought. Some of those comet chunks are a kilometer or so in diameter. What would their effect be as they streaked into the Jovian atmosphere at speeds of several tens of kilometers per second?

Jupiter, a dozen times the diameter

of Earth, is a gas giant planet and as such probably has no solid surface as we know it. We have studied its cloud patterns for years and have observed a giant hurricane called the Great Red Spot which has persisted for over two centuries.* There are other, relatively smaller storms which we have tracked. The planet has a persistent set of dark and light bands at various latitudes which indicate a regular atmospheric flow pattern.

This is not the first time that Jupiter has broken up a comet. In 1886 comet P/Brooks 2 ventured too close and split into two pieces but was not captured in a closed orbit. Jupiter has captured other comets temporarily in loose orbits which, after a revolution or two, are perturbed by gravitational forces from the Sun or passing planets and the comet eventually escapes. Recent studies associating crater chains on Ganymede and Callisto may indicate that events such as this happen more often than was formerly thought—as often as once a century or so.

There is some speculation that Comet Shoemaker-Levy may have been in orbit about Jupiter for more than one revolution. At the time of writing (October, 1993) with only seven months of tracking data available, orbits could be computed (within the known observational error limits) in which the comet had been captured as long as 20 years ago. At a brightness of $M_v$24 (about as faint as the best ground-based telescopes can detect) as seen from Earth, it could easily have been missed by large telescopes or passing exploration spacecraft. Gravitational perturbations from the Sun, passing planets, or the Galilean Moons may have finally modified the orbit so that it fell within the Roche limit. Only when it broke up, exposing fresh ice to Sunlight, did it form a sufficient tail to be noticed by comet hunters. As the pieces orbit in formation, they are slowly drifting apart. When they were discovered, the whole collection was one arc minute in size. By the time of impact, they will span one degree of sky as seen from Earth. This implies a chain of objects more than 13.7 million km long. Since the main chunks are only between 0.5 and 1 km in diameter, it would be difficult to spot one with the naked eye even if you were standing on the adjacent one.

For a while astronomers were uncertain if the comet might really be an asteroid and the tails observed might be dust particles and small pebbles streaming away under pressure from the solar wind. This has serious implications for those trying to model the impact mathematically. A comet is thought to be a fragile thing composed of ice and dust. Some think they might be mostly vacuum. It would break up soon after encountering the upper Jovian atmosphere. An asteroid, however, is made of rock and would bore through the cloud tops, depositing its energy much deeper in the atmosphere. The persistence of the tail argues for a cometary origin and almost all asteroid proponents have been converted. Comet discoverer David Levy expects the larger chunks of the comet to hold together and punch through the cloud layer. The estimated velocity at impact is about 60 km/sec and any shock waves breaking up the fragment may not have time to propagate through the body at the speed of sound before it plunges deep within the Jovian atmosphere.

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*One theory concerning the Great Red Spot is that it was formed when an asteroid or comet plunged into the atmosphere. So far this is unprovable since the first appearance of the Spot occurred when telescopes were in their infancy and sparse records are available to back up the claim.

At least 10 teams are trying to model the impact using large supercomputers. This is difficult due to a large number of unknowns relating to the comet density and its tensile strength. The velocity vectors of each piece are fairly easy to calculate but what happens when a frangible object hits a dense atmosphere is still a theoretical study. The total energy of impact could be as large as the equivalent of 100 million megatons of TNT—about five orders of magnitude greater than all the nuclear weapons ever made. To give you a feeling for the forces and energies involved, a 2.5 km diameter chunk of comet falling into Jupiter's atmosphere has a kinetic energy equivalent to 45 million megatons of TNT. The energy will be observable as a fireball (this is a term from nuclear weapons technology—nothing is actually on fire) whose greatest flux isn't visible. The peak luminosity is in soft X-rays at a wavelength of about 100Å. The energy is absorbed by the atmosphere and reradiated at longer (visible) wavelengths and is also stored in the Jovian gasses as heat. All of this energy is deposited in the atmosphere rapidly—although some researchers feel that the process may take as long as 100 seconds per impact. Others argue for more speedy events. This all depends on how long the comet pieces can hold together as they are decelerated by the Jovian atmosphere. The *g* forces involved imply that no known material can withstand impact with Jupiter. It's merely a question of how long (and how low in the Jovian atmosphere) can you go.

What might one expect to see during the impact? About a month before the first strike, some of the dust and debris associated with the formation will start to reach Jupiter. Aurorae and some upper atmospheric radio effects may be detectible. The larger pieces will not hit all at once. For an interval of about 5.6 days centered on 21 July 1994 the pieces will individually strike the planet. That means three or four impacts per day, allowing astronomers from all around Earth an equal chance to observe the events. In July of 1994 Jupiter will be easily visible in the early evening. A nearly full Moon (and this is but one day after the 25th anniversary of the first Moon landing) in the East won't interfere too much, as Jupiter will be in the west. Of course, spaceborne instruments such as the Hubble telescope can observe at any time.

The bad news is that our best estimates of the impact point place it on the far side away from Earth at a latitude of −37°±3° (a more recent independent estimate puts the latitude at −44°), just south of the latitude of the Great Red Spot. The good news is that the impact will happen at a place about one hour of rotation from the morning limb. Jupiter rotates rapidly, with a period of only 9.8 hours, so we should have a clear view of any lingering atmospheric effects within two hours of an impact. We may still be able to measure the total energy of an impact by watching the Galilean moons, two of which will be on the far side of Jupiter during impacts. Astronomers expect any flash in Jupiter's atmosphere to be reflected off the moons. One of them, Io, will be in Jupiter's shadow for part of the time and thus even a slight brightening would be discernible against its darkened face.

I asked John Lewis of the University of Arizona's Lunar and Planetary Laboratory to do a rough calculation of the observability of the phenomenon. Assuming a 2.5 km chunk, the moon Io would brighten between 1% and 50% depending on some assumptions about flash duration and the comet's composition. This is for conditions when Io is not in Jupiter's shadow. He cautions that the range of uncertainty overlaps the range of interest. The most wildly optimistic estimates predict that Io could become as bright as visual magnitude 2.7, almost rivaling Jupiter in brightness. This could be a naked-eye event!

Two alternate scenarios have been proposed. One is that as the comet fragments re-enter Jupiter's Roche limit they will break up again into much smaller fragments. In this case, a brief flash in the upper atmosphere is expected with little or no long-term effects in Jupiter's lower cloud patterns. This would result in a brighter, shorter flash. The second scenario also includes further fragmentation and capture of small particles by Jupiter's ring system which may then become much more visible.

Several people have suggested using unmanned spacecraft to observe the event. Aside from the fact that it takes 10 years to fund and build current projects, a year or more is generally required to transport the instruments as far as Jupiter. There is a spacecraft, Galileo, which is currently en route to the planet but will not arrive in time. It will, however, allow us to observe (at a distance) from a slightly different perspective. Indeed, the spacecraft may have a direct view of the impact sites, although the camera resolution at its current distance will not have sufficient detail to yield images. Photometry measuring the total impact energy released in various parts of the spectrum is possible, however. Some have suggested reactivating the old Voyager Spacecraft cameras to look back on Jupiter. The main problem here is that Jupiter is much closer to Earth than to the Voyager spacecraft* and there's serious question as to how much information can be collected from that distance.

Astronomers are making mathematical models of what they think will happen, in order to design experiments and observations to check their calculations. At the time of writing, nine months before the event, many of the models are still in a "preliminary" stage. In other words, most scientists would not like to make claims at this time as to how observable the events will be. Even the day before the first impact they will not claim to know what they are going see. They will cautiously point out particular things to look for and strategies for collecting data. Astronomers are a conservative bunch and even after the observations are over they will write their results in tentative terms. Only after they see several types of comet impacts on more than one planet will they assert that they understand the phenomenon. There are, as one researcher remarked, vast oceans of ignorance yet to be navigated.

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*Do you have any feeling for just how far the Voyagers have traveled in the last couple of decades? Well, you're wrong. They're much farther away than you thought!

Since it's too early to predict exactly what to look for and how to observe, I shall mention some resources the reader might investigate. Certainly the popular astronomy magazines will have late-breaking news of the comet in their summer issues. They will probably have a couple of "how to observe" articles which mention specific equipment (and a modest hobbyist telescope will yield good views of Jupiter and its cloud patterns on any night—not just during comet impacts). Your local astronomy club will usually have at least one member connected via Internet to the International Astronomical Union Circular bulletins. These bulletins will probably be the most up-to-the-minute announcements of impact times. Can't find your local astronomy club? Hit the local library—and they also have the popular astronomy magazines. Occasionally WWV and WWVH radio (the station with the time signals at 2.5, 5, 10 and 15 MHz) will also announce major astronomical events.

I plan to be over at a friend's observatory videotaping the events. We may not even get any data of scientific interest. But then again, this is the Comet of the Century. Upon a little reflection, let me correct that—in view of the impending end of the current century. This is the Comet of the Millennium!

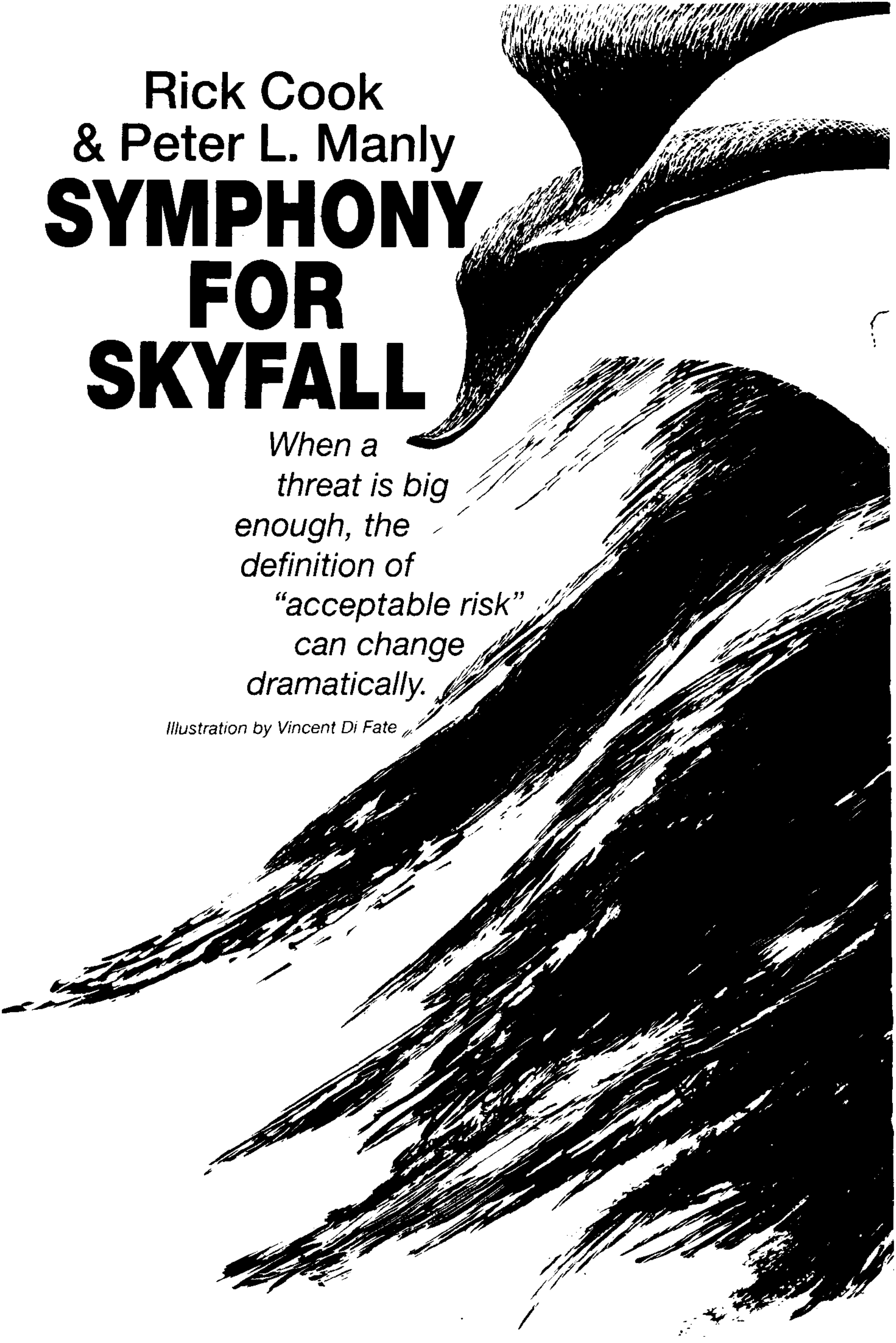
*I would like to thank David Levy of Jarnac Observatory and Jim Scotti and John Lewis of the Lunar and Planetary Laboratory for contributing information to this article, which was written long before scientists normally publish papers on such events. If you have any questions or comments, I can be reached at petemanly@bix.com on the Internet.* ■

Rick Cook
& Peter L. Manly

# SYMPHONY FOR SKYFALL

*When a threat is big enough, the definition of "acceptable risk" can change dramatically.*

*Illustration by Vincent Di Fate*



Shark!

Ensign stretched his timpani even tighter and listened again. The clouds swirled around his body, obscuring his own wingtips in the mist of opaque orange and pink. Wind-driven ice crystals stung against his taut membranes. The air pressed in on him thick and oppressive. He wished he were above the clouds and out in the clean sunlight with the rest of his pod. Reflexively his body twitched toward a more aerodynamic shape that would let him rise faster. But he forced himself to relax into a listening posture. Trying to out-climb a shark was a fool's game and a fool would not survive this day.

*Dum-Doom.*

The shark's hunting pulse swept over him again as the predator sought him through the clouds. Close, but not too close. With the disturbance caused by the nearby thermocline the hunter would have trouble finding him. Ensign listened so hard his muscles ached from the strain of holding his hearing membranes taut. He knew that if he used his jet the shark could home in on the sound instantly—so he used the slower, quieter, and more drawn-out method of relaxing his buoyancy chambers, letting them inflate silently to float him upward, continuing his painfully slow rise to sunlight and safety.

*Dum-Doom Dum-Doom*

Two pulses this time! Ensign cursed his luck. The shark had his general direction now and swept back and forth over a narrower sector, moving its beam faster. Soon it would be close enough to switch to high frequency for the final, slashing attack. Ensign sucked the warm, thick atmosphere through his maw, supercharging his system for the action to come. He felt a quiver along his flanks as his remoras sensed his fear and shifted uneasily.

*Dum-Doom Dum-Doom*

RUN! His instincts screamed. Flatten out, expel his store of hydrogen through rear orifices and shoot for the cloud tops. But his self-control held and he kept his pace. Reason told him he was too deep to get clear of the clouds and even if he did, the shark could take him on a lunge, rending him, slashing open buoyancy cells and feasting at leisure as he fell back helplessly into the clouds.

Yet reason also told him the shark would find him soon. The shark was a creature of the clouds and down here in the dark heat and thick air the advantage lay with the hunter.

Think! There had to be a way. Think!

*Dum-Doom Dum-Doom Dum-Doom*

*"Caught in the clouds with one shark on the way. . . ."*

The scrap of song crossed his mind. Yes, that was it! But what was the rest of the song? *Caught in the clouds. . . .* It wouldn't come. He hummed the melody in his head, striving for the next line but it wasn't there. Nothing.

Gently, softly, Ensign sang out through his earmouths, *"Caught in the clouds with one shark on the way. . . ."* Come on! Sing me the rest!

He felt motion along his terror-tight skin as one of his remoras eased forward to an earmouth on his back. There was a warm tickling as the symbiote clamped its suction head to the special membrane and then the membrane vibrated as the remora picked up the memorized song.

*Caught in the clouds with one shark on the way*
*coursing and hunting and driving its prey.*
*As you twist and you turn from the shark you can see*
*beware of the one that hangs in its lee. . . .*

Of course! There were two sharks. The remora's song formed the picture clearly in his mind. As soon as he swerved away from the first shark he'd put himself square in the path of the attack of the second. Ensign thought he remembered what came next, but he stilled himself to listen to his companion's far more accurate rendition.

*. . . In clouds sharks are nimble. From their swoop you can't flee*
*But blind them, confuse them, and you can break free. . . .*

There was much more. Ensign drank it in as quickly as the remora could sing it to him in six-part harmony.

*Dum-Doom Dum-Doom Dum-Doom Dum Dum Dum Dum*

The shark had him! Ensign's whole body quivered as the shark switched to a higher frequency for precise location. Sensing his haste, the remora picked up the tempo, the song becoming a buzzing multifrequency squeak as the little friend tried to jam the information into his mind.

*Dum Dum Dum Dum Dum Dum Dum*

Faster and closer came the sound of the hunting shark. It was rising now, moving into position for a killing surge. No time to review, Ensign had to act.

He willed himself to narrow his hearing to the middle frequencies, concentrating on the shark's voice, picking up its rhythm.

*DumDumDum DumDum DumDum DumDum DumDum DumDum DumDum DumDum Dum*

Ensign added his own pulses to the hunting shark's, matching the predator's frequency and pulse shape with automatic ease. The shark quickened its call and shifted to a higher frequency, the added pulses making it think he was closer than he was.

*DumSumDumSumDumSumDum SumDumSumDumSumDumSumDum SumDumSumDumSum*

Ensign varied his pulses as the song directed. Still the shark climbed, but Ensign could sense the first edge of uncertainty in its hunting cry. Now the song told him to add a new sound in the middle frequencies.

*SumhissDumSumhissDumSumhisss DumSumhisssDumSumhissssDumSum hissssDumSumhissssss*

The shark's beam wavered and lost focus. It dropped in frequency to cover a wider area. Ensign felt the shark moving away to the north. Quietly he eased to the south, increasing his volume to mask his movements.

*DumSumhissssss*click*DumSumhissssss*click*DumSumhissssss*click*Dum Sumhissssss*click*pop**

As the song instructed, Ensign added more noise to the higher frequency to cloak his position and further hide him from the second shark. All along his flanks and back his remoras twitched and shifted nervously under the impact of the unnatural sound.

Frantically the shark began to shift tempo and frequencies, seeking a clear channel even if it were suboptimal. But the song prepared Ensign for that too. Sharks have little musical imagination and the pattern of the shift, first higher and faster, then lower and slower, then jumping suddenly to higher and slower, was foretold in the song. Ensign matched the shark shift for shift, leaving it coursing blindly in the murk. Just to be safe he added a syncopation.

The shark's signal stuttered, wavered and faded. Still close but out of charging range. Now came the song's final stanza. Ensign contracted muscles all along his body, sacrificing hearing sensitivity for aerodynamic efficiency. With powerful flaps of his outer wings he began to climb for the cloud tops and safety.

*Du. . . .*

The shark's search beam flashed over him almost too quickly to register. But the shark was too far away and headed in the wrong direction. As the clouds lightened around him and began to fade into rainbow-tinted fog, Ensign could picture the hunter slewing frantically, lashing out with his sonar trying to find him again.

Then he was out in the sunlight, floating deep in a canyon formed by two cloud banks. He sucked in air, reveling in the clear, clean sting of ammonia. Ensign expanded in triumph as—

*SKREEEEEE*

With a blast of hunting sound the second shark hurtled out of the clouds. Ensign barely had a glimpse of the dark torpedo shape as it tore down on him. Instinctively he rolled right and roared out on all frequencies using all his upper timpani to focus sound on his attacker. The shark twitched under the force of the blast and missed by a remora-length as Ensign rolled away and struck out with a wingtip to batter the shark as it dove. Then, without waiting to right himself he expelled hydrogen in a single huge gust that sent him zooming above the cloud tops. His lower eyes gave him a confused vision of the shark twisting away as it shrank back into the murky depths.

Ensign was nearly upside down when he got his tumbling body under control. With a heave and a twist he righted himself and hung in the cloud bank's updraft, every muscle quivering from exertion and release. One or two remoras who were shaken loose by his violent maneuvering glided in to reattach themselves.

The second shark! It hadn't stayed low as the song said. While Ensign spoofed its mate the second predator had climbed above him and waited in ambush. Perhaps it had deliberately headed for the nearest rift in the clouds knowing he would instinctively seek the first clear air he could find.

And it had nearly worked. If the shark had held its swoop for just a little longer, or if Ensign had been a little slower to react, he would be a slashed and bleeding wreck sinking into eternal darkness as the sharks tore at him.

He quickly reviewed the newly learned song and confirmed that it didn't mention the tactic. Another verse to be added, then, taught to the remoras and spread through them to High Folk everywhere. And one more proof that, for all their viciousness, sharks could learn.

"Thanks, little friend," he vibrated through his earmouth to the remora whose memory had saved them. There was a warm tickling on his earmouth as the remora purred in pleasure.

Ensign scanned for his companions and took stock. He'd vented more hydrogen than was healthy in his jet-driven climb. His buoyancy cells were so low he had to flap occasionally to hold position even in an updraft. He'd have to work to stay up with the pod for the next several days as he rebuilt his hydrogen reserves. But he was alive and that was the important thing.

Ensign expanded as best he could under the influence of a sun too cold for human sensing and almost too dim for human sight. But then no human would ever visit Jupiter's cloud tops unaided by a mountain of special protective gear.

Nor would any of the High Folk ever visit humanity's home. In spite of his 120-meter wingspan and powerful muscles, Ensign's manta body was fundamentally shaped by internal gas pressure in the network of cells, bladders and chambers that made up more than 90 percent of his volume. His nervous system was perhaps more complex than a human's and his body could stand external pressures from three Earth atmospheres down to less than 1 percent of Earth normal—not to mention temperatures from above freezing point of water down to far below anything ever found on Earth. But for all his complexity, adaptability, and strength, Ensign was basically as fragile as a balloon in a Thanksgiving Day parade.

Off to the east and a couple of thousand wingspans below, Ensign spotted the dark manta shapes of the other members of the Bach Choir working their leisurely way through the field of plankton. With a quick flip of his wings, Ensign glided off the updraft to join them.

"Ensign, what was that all about?" Melody called as soon as he got close. She had slimmed her body out of feeding mode to tighten her timpani so she could talk and hear him before the others.

Ensign paled in embarrassment as he realized the whole pod had seen him after he came up over the cloud bank. "Sharks," he said quickly. "Two of them, down in the clouds." Quickly, as only a being who speaks on twenty or more frequencies at once can, he related the encounter, including the shark's new tactic and his wingtip-breadth escape. The other members of the Bach Choir rearranged themselves so they could hear his tale as they grazed.

"That's really something," The Geek said enthusiastically when he finished. "Hey, maybe we can turn it into a performance piece."

"Yeah," came a sarcastic retort from above them, "a comedy number."

Ensign looked over Melody and The Geek and saw Killer had maneuvered in close. The Bach Choir's lead singer floated above and behind Melody in a position that was so proprietary it verged on insulting. Ensign checked his temper and The Geek made an inarticulate protest.

"You should have seen yourself when you broke out of the clouds," Killer chortled. "You were doing a half barrel roll and I swear it looked like you stalled out on the top. If you showed a shark moves like that it's no wonder you confused him."

"It wasn't intentional," Ensign muttered.

"Intentional or not it was one of the best pieces of comedy aerobatics I've ever seen. Polish it up and we can use it as an interlude at our next concert. While we get set up for the serious singing."

There was a brief, strained silence. "Seriously," Killer went on without missing a beat. "I'm glad you're safe."

The way he said it left no doubt he was sincere but it didn't draw the sting. Before Ensign could reply Melody cut in.

"Did you find Teacher? Is he near?"

"Closer than we thought," Ensign said, not sure whether he felt glad of the distraction or not. "He should be here in a few more day tenths."

That set the whole choir to muttering and buzzing. Ensign had dropped down to a thermocline to seek out travelers at long range. Sound carried far down there if you limited yourself to lower frequencies and the ability to communicate over long distances made it worth the greater risk of shark attacks.

"There's more," Ensign added. "He says he's bringing someone with him."

"Who?" asked Yearling, pushing forward in a manner that would have been rude in someone else. In Yearling it was just part of an odd mix of juvenile behavior and towering musical talent that made Yearling Yearling.

Ensign rippled his trailing edge in the High Folk's equivalent of a shrug. "Didn't say. Not enough time."

Yearling's wingtips drooped in semi-serious disappointment. Low frequencies meant low data rates and the longer you stayed at those depths the more likely you were to attract sharks.

"It would help us to know," Killer said. "It may be another Master."

Again, Ensign bit back a retort. His relations with the Bach Choir's lead singer had become progressively more strained this season and unlike Killer, Ensign didn't want to do anything to make them worse. As much as he could he ignored the older singer's needling. But that was getting harder and harder.

"Should we start our welcoming song now?" Melody cut in.

"Good idea," Killer told her. "We need the practice. Spread out and we'll run through it. Geek, this time try to hold to the beat. Yearling, watch the high notes. And Ensign, you're still pretty worn, if you want to rest—"

"I'll handle my part," Ensign gritted.

Almost automatically the Bach Choir sorted itself out into a performance formation, line-abreast so their song would reach as far as possible. Since the High Folk sang through their skins rather than their mouths the Bach Choir could keep their fore scoops and belly vents wide to continue sucking in plankton-laden air and straining out the hordes of tiny creatures. But they altered their shapes for best sound production rather than most efficient grazing.

*"Come ye weary travelers,"* Killer sang out strong and resonant in a narrow band of middle frequencies.

*"Come gather and be welcome,"* Melody's voice soared above Killer's in higher range. Crystal came in over top adding her distinctive trill. Shorty and the three newest singers, Winger, Floater and Fuzzvoice moved into position to add counterpoint to the basic theme.

*"Come now and join us,"* the rest of the choir picked up.

*"Come, come, come, come,"* Drummer and Droner sang out the low register, their whole bodies pulsing with the effort. Then all but Drummer and Droner paused for the listening period.

*"Join us in the plankton fields,"* Killer carried on.

*"Come and take the guest's place,"* Melody and Jane trilled.

*"Come and be welcome,"* the choir continued

*"Come, come, come, come,"* the bass section pounded out, running in riffs while holding the basic beat.

Ensign had lost so much hydrogen it was hard for him to sing. In a couple of spots he had to cheat and he knew that Killer noticed. But still he held his place, trying to produce the sounds allotted him as perfectly and clearly as if he had rested for a week.

*"We come. We come."* Faintly and far away came the traditional traveler's response at the pause. As one the Bach Choir turned in the direction of the sound so their song would be an even clearer guide. Off in the distance Ensign could see two tiny dark specks moving against the opalescent clouds. As the song and response continued they resolved themselves into two of the High Folk.

Even as the song continued, Ensign frowned to himself. The larger person must be Teacher, but who was the other one? The shape appeared so small it must be a child. But why would Teacher bring a child on such a journey?

One of the travelers was undoubtedly Teacher. None among the High Folk had such a commanding voice, such pure technique or such a fine inventiveness even on the stereotypical response to the greeting song. It was a voice and technique they all knew well. Nearly all of the Bach Choir had studied under Teacher. Some of them had come from halfway around Jupiter to learn from him. If his voice was no longer as ripe and full as it had been, if his timpani stiffened with age, there was still no question that Teacher was the greatest master of their time.

And his companion? As the pair came closer Ensign could begin to locate the voices more clearly. There was something wrong here! Ensign's confusion deepened and then suddenly cleared. Teacher was the small one. And his companion was not young, but old. So old he looked puffy with expanded gas cells his aging muscles could no longer slim to a proper traveling shape. An ancient. But who? And why had Teacher brought someone like that?

Without missing a beat, Teacher and his companion glided into the places of honor in the formation moving through the plankton field. As they slid in, Ensign found another problem with the old one. He mumbled. He threw off a constant stream of wheezes, snorts and bits of phrases, apparently without realizing it. Ensign's skin tightened in distaste and he moved as far away from the oldster as etiquette permitted. Why in the name of all Below and Above had Teacher brought him?

Killer sang the formal greeting and the whole choir chimed in on the chorus, each offering a fragment of his or her own. Teacher responded warmly yet gravely with a carefully controlled invention. The oldster stumbled and muttered through a trite formula of response.

"Well sung, all of you," Teacher half-said, half-sang as soon as the formalities completed. "Drummer, you and Droner are unusually strong. Melody, Crystal, you carry a lovely harmony. And Killer, your singing is clearly up to your early promise."

All of them puffed and flushed with pride at their teacher's praise. Even Killer, who tried to hide it, expanded a little.

"But to business then," Teacher half-said, half-sang. Almost without thinking the members of the Bach Choir rearranged themselves around their two visitors in classroom formation.

"You're famous, you know," Teacher said. "There is not an eclipse, a transit or a convocation held in the whole band without one of your songs." He swept a searching beam over them all. "You have broken new ground in harmonies and song structure. Quite a remarkable achievement in ones so young."

The choir members murmured a response. Then they waited. When Teacher started with an updraft there was sure to be a downdraft close behind.

"With your fame comes responsibility, and you have a task before you."

The choir shifted and muttered in little bursts of sound. Teacher addressed them as if they were still pupils, children, not independent adults with their own pod.

Teacher continued, "My traveling companion is from Newcomb Pod, far to the south. He has come to meet the best of the younger pods and when he asked me, I suggested you." Teacher wiggled a wingtip in a self-deprecating gesture. "Simon and his pod track the stars and the moons, predicting eclipses so the folk can gather for songs and rituals. With their songs and their watching they can predict a gathering time a thousand days in advance." Teacher surveyed his class and continued, "One such a prediction has set a task for you."

"High task. Long task. Task taken . . . bzzzzhmm . . . " the old one mumbled.

"A special festival?" Yearling cut in. "A Grand Gathering of moons?"

In spite of his fatigue, Ensign's soul soared at the prospect. Sometimes the shadows of two or more moons would join together in a Grand Gathering. Those were special times for the High Folk and worthy of very special songs—if the singers had time to prepare them.

"Tell us what you desire of us," Killer responded formally for the choir.

Instead of answering directly Teacher rocked back on his axis, as if studying the sky with his main eyes. "Soon enough. It lacks something of evening however, so there is time. Do any of you know the Skyfall Song?"

Ensign felt utterly bewildered. Out of the corner of his eyes he could see he wasn't the only one. The whole pod appeared obviously confused. Even Killer seemed uncertain.

"The Skyfall Song?"

"Yes, the one that begins *'In the east we saw it.'* "

There was more shifting and shrugging as the members of the choir repeated the request to their remoras. Finally Drummer, The Geek and Crystal eased forward, indicating their remoras knew that song.

"Sing it for the others please," Teacher asked, as if demanding an impromptu recital in school.

After a moment's confusion, the trio rearranged themselves close enough so they could communicate at very high frequency to keep together on the unfamiliar song. Then Drummer, the most experienced performer, gave the cue and the three picked up the song.

*"In the east we saw it.*
*High in the sky we saw it.*
*Gliding from the north we saw it,*
*nearer every night."*

The beat came raggedly and with only three voices to cover all the parts the performance sounded thin. But Teacher didn't seem to notice. Nor did he demand they start again when they got slightly out of phase. He only bobbed assent, as if lost in the song.

*"For fourteen days we saw it.*
*A point of light we saw it.*
*Moving in the sky we saw it,*
*growing ever bright."*

Something about this tugged at Ensign's memory. He didn't know the song, nor was it among the thousands his remoras had memorized. The pattern and the rhythm were old, a chanson style used only for important history songs. He did not know the song, and yet. . . .

*"Stabbing down we saw it.*
*a pillar of fire we saw it.*
*brighter than the sun we saw it,*
*lightning beyond the light."*

It would take volumes to convey the song in any human language and all those books couldn't begin to approximate the emotional impact of the throbbing subsonics and keening, piercing high notes, of the pressure of all the information crashing in on the senses at once.

*Burnbright pod they saw it*
*from three days out they saw it*
*at the last they saw it,*
*went shrieking to their doom.*

*Half the pods they saw it*
*from horizon to horizon*
*they saw it*
*in fire and wind they saw it,*
*and now they are no more.*

On and on the Skyfall Song swept, carrying the Bach Choir with it in its tale of holocaust. Of pods wiped out in an eyeblink, crushed by pressure waves, battered apart by hurricanes, seared by unimaginable heat. Of High Folk burning like torches as they fell into the clouds, of the clouds themselves parted and roiling as the very order of the world was overturned. And above all of loss. The terrible, terrible loss.

*"Still today we see it,"* sang the three.

*"In the south we see it."* Their voices soared together nearly beyond hearing.

*"Sweeping round the world we see*
*it, red memory of our doom."*

The Bach Choir remained silent as the last notes died away. Ensign felt his flanks quiver in grief and his breath come hard to stick in his throat. Over on the far side someone—Crystal?—began the Mourning Song. Without thinking, the rest of the choir picked up the ancient, unadorned melody.

Gradually the Mourning Song faded into silence in the deepening twilight.

"It is an old song," Teacher said at last. "A thing from long ago. But you can still see the result today."

"The Great Red Spot," breathed The Geek.

Teacher bobbed assent. "This is the song of how it came to be. Now," he commanded suddenly. "Look over to the west. There, above Ganymede and to the right."

As one the Bach choir swung in the indicated direction.

"There's something there," Melody said. "A wandering star."

"No," The Geek said. "Wanderers follow fixed patterns. This," he hesitated, "I don't think this is mentioned in any of the sky songs."

"It is new. Now, look above and farther right."

Ensign squinted with effort as he deformed the lenses of his main eyes to bring the area into focus. A human would have needed a telescope, but each of Ensign's two main eyes was larger than a man was tall and the lenses were backed by several square meters of imaging surface all feeding an image processing system that would put an Earthly eagle or owl to shame. If he looked very hard he could see. . . .

"Another one," The Geek said. "Just above it."

"And one above that and another above that," Teacher told them. "And others yet, if you know where and when to look. We do not think any of them are as big as the one in the Skyfall Song. But they are big enough."

"What are they?" The Geek demanded.

Teacher rippled a shrug. "Pieces of the sky. We only know they will fall, and soon. As they come closer we will know more, but by then it will be too late."

"Too late for what?" asked Killer.

"Salvation," Teacher said quietly.

In spite of himself, Ensign felt his body twitch toward the fleeing shape.

"But you said this one wasn't big," Crystal protested.

"Big enough," wheezed Simon. "Big enough and more than one. Many, many more. Twenty of them at last count."

Stunned silence. "Twenty to go," mumbled Simon. "Twenty to come, twenty. . . . sshhhhhisss."

"We think they will all fall within three or four days," Teacher said tightly. "Rather than one great storm, we will have many which will be almost as great."

"Like facing a whole pod of sharks," Droner said quietly. "Move to avoid one and you are in the path of another." Teacher bobbed gravely.

"Then there is nothing we can do," Melody said softly.

"No, there is something we can do." Teacher looked over the entire Bach Choir. "Something you all must do.

"We do not know exactly where the sky will fall, but we have some idea where it is less likely to fall. North is safer than south. We need to go north as far and as quickly as possible. We need to save the songs that are our past and future—the songs that are us."

"How do we know where they will fall and where they won't?" Ensign asked.

"We watch," Simon wheezed. "We measure. We sing songs of prediction. We make new songs." The ancient sucked air, as if speaking more than two sentences exhausted him.

Simon seemed to be gathering himself to wheeze out something more when Yearling jumped in. "That means we go traveling again. We've already been from both the North to South edges of the South Temperate Zone and tasted the whirlwinds where the clouds slip by each other."

Teacher dipped his wingtips in a frown. "We will have to cross the edge into the south Temperate Belt, where the air sinks and one must always climb. Then if we can we must cross into the south Tropical Zone."

Killer became rigid with controlled disagreement. "If you think we're going anywhere near the Great Red Spot. . . ."

Teacher made a placating gesture, "The Spot is on the other side of the world. We won't be anywhere near it. But even that Zone will not be safe. For safety we must go even farther north."

"How far north?" The Geek asked.

"As far as we can," Teacher said gravely. "Even above the equator if we have time."

That subdued even Yearling. Few of the High Folk had crossed even one band edge in their lives. Now Teacher told them they would have to make the dangerous crossings several times in a row, and to do it as quickly as they could.

"And there will be new songs to learn," Teacher added. "Many new songs."

"Other peoples' songs," Killer rumbled out slowly. "We would be singing others' songs." Clearly he didn't like the thought.

"Yours and many others," Teacher said. "We will carry as much knowledge as possible."

"And we're the only ones going?"

"No. Others have been warned. Some are gathering songs and fleeing. But you are unique."

That was true enough. Most choirs were regular pods, family groups with young and pregnant females to slow them down. The Bach Choir was an artificial creation, all the members about the same age and bound together by their talent and their music. There were no young or pregnant females. Slightly scandalous to be sure, but that reputation suited the Choir's image of itself. Ensign had never thought of the composition as a survival advantage. He found he didn't much like the notion, however true it might be.

"Some, but not everyone?" Killer asked sharply.

"No," Teacher said tiredly, "not everyone."

"And you say you don't know where the sky will fall? We might be running into danger instead of away from it?"

"What is your point?"

"My point," Killer spit with sharp resonating consonants, "is that this is a fool's errand." He paused, recognizing that he had gone too far. "I'm sorry, Teacher," he continued more gently. "I respect you and your knowledge. But this is wrong."

Killer swung slightly, addressing the group as much as Teacher. "You and Simon say we might die in skyfall if we stay here, but you're not sure. I'll tell you what is sure. If we try to travel north across the bands, we *will* die. It is the wrong season, the edge storms will be bad and we have not fed for the journey. You're asking us to wager a possible doom against the certain destruction of the Bach Choir. I won't take that bet."

Ensign noted that Winger, Floater, and Fuzzvoice edged around the pod to hover behind Killer. Shorty had separated from both groups and hung off to one side, clearly not a part of either.

"Well, I will take the wager," Melody sang out. "Look at us. We're what Teacher made us and I can't believe he'd steer us falsely."

"Perhaps not deliberately," Drummer boomed in the lower registers, the force of his reply roiling the plankton ahead of him. "But he can be as wrong as any of the rest of us."

"Still, I trust him," Melody said stubbornly.

"That's illogical," Killer told her. "Have you ever seen the band edge storms? I have."

Melody hesitated and before anyone could respond Teacher spoke. "You say we would all die in the crossings?" he asked sharply.

"Perhaps not, but there wouldn't be enough of us left. One cannot carry all the songs. Not two, not three. Without enough to make up a choir we'd lose the thing that makes us *us.*"

"And what is it that makes us? Sharks sing, after all."

Killer ignored the insult. "They don't sing like we do."

"Precisely. Sharks don't pass on their songs. But what if we lose the songs? Will we still be us then? Not just the Bach Choir, but the entire High Folk. We have to save the songs and you are our best chance.

"So which is greater?" Teacher continued. "Your concern for the Bach Choir or concern for all of the High Folk?"

Killer contracted with rage. He puffed up as if to shout, contracted again and settled for snorting on all frequencies. "You can do what you want," he said quietly. "I am staying."

"I'm staying too," Drummer said and behind him, Wringer, Floater and Fuzzvoice bobbed in agreement.

"I cannot force you," Teacher said gently.

Killer gave another snort, expanded and cut up over the formation in a swoop that brought him close to passing above and behind Teacher. He couldn't quite bring himself to do it, so he settled for passing over Ensign so low and close Ensign wanted to reach up and slap his vulnerable underside as he went by. Drummer and the others followed in a loose gaggle.

*It's finally come,* Ensign thought numbly. The split they had all dreaded in secret was out in the open. He was surprised to find he was more relieved than anything else. And also obscurely glad he had no part in it.

Simon wheezed something incoherent. A free-swimming remora flapped toward Ensign, then folded its wings tight against his body and settled on one of his earmouths. "Nice folks don't do things like that!" came Crystal's easy trill. "Don't worry about Killer, Ensign. Just let him go off and sulk."

"Thanks," Ensign vibrated back to the remora, "I appreciate it." Then he twitched the remora with the new message off his body to return to the sender.

"If speed is so important won't the old one slow us down?" The Geek asked to break the tension.

"Perhaps," Teacher said, "but we will need him."

*He doesn't seem upset,* Ensign thought, watching Teacher closely. Somehow there was more to this than he understood. That bothered him so much he sought out Shorty later. Not only was he several seasons older than the rest of the Bach Choir, he had studied with Teacher longer than any of the others.

"Did you get the feeling Teacher expected the Choir to split when he set his task?" he asked as their grazing brought them close in the plankton fields.

The question seemed to amuse the older male. "Teacher keeps close track of his pupils. There's probably not a lot that goes on in the Bach Choir he doesn't know. And what he doesn't know he can guess."

"But if he knew it would split us why did he do it?"

Shorty paused and cocked a main eye at Ensign. "Think it through. He doesn't know where Skyfall will come and he wants the songs to survive. Which has the better chance? One pod or two widely separated ones?"

"But that's so ruthless!" Among the High Folk splitting a pod in bad feeling was a tragedy.

Shorty moved closer to Ensign, so close it was almost improper. "When it suits his purposes Teacher can be as ruthless as a shark," he said very softly. "Do you know he's abandoned remoras just because others came along who could hold more songs?

"I don't believe it!"

"I was there. We all had full loads and there was no one to take the surplus. So he just dumped them."

"That's monstrous!"

"Son, you've got a lot to learn about being a pod leader," Shorty said quietly. "Especially about being as great a leader as Teacher."

"But he's so warm, so loving."

"Oh yes. He genuinely likes all of us. In some ways we're more his children than the ones he sired. But don't think that would save any of us if he believed it was necessary to doom us for some higher purpose."

"And this trip?"

"I think someone convinced him it's necessary. Probably Simon. And now he's using what he's built in the years he taught and nurtured us to get us to go with him." He rippled his trailing edge in ironic amusement. "All part of a pod leader's job. You spend your life building up good will and then sometimes you cash that good will in."

Ensign was shocked to silence. For several minutes they flew side by side without speaking. Finally Shorty broke in on his thoughts.

"Son, one day you're going to get a chance at the pod leader's job. Before you take it you'd better think long and hard about what you may have to do in order to do the job right. You just might decide you don't want that job after all."

Then with a lift and swoop Shorty moved away, leaving Ensign alone in the lightning-shot dark.

The group spent the night feeding and exchanging remoras with the Choir members who were staying. Unlike most partings, it was a strained, almost ritualistic affair. Both groups kept to themselves and sent the remoras over long distances. That slowed the exchange of information. Worse, many of the Bach Choir's songs were so complicated that no single remora held all of them. Each group ended up with isolated pieces of some of their most important songs. They would have to try to reconstruct them later.

*Already we are losing parts of ourselves,* Ensign thought. He wondered how much more they would lose before the journey was over.

The travelers left the next morning, rising up and away from the plankton fields, expanding their bodies to ride the updrafts towards the high, cold sky.

*Little enough food in the spaces between the edges,* Ensign thought as they floated upward and turned toward the north. Feeding had been fairly good but none of them had much surplus. Plankton was richest and feeding safest in the turbulent areas around the edges of the semi-permanent cyclonic storms that formed in the zones. The upwelling currents sucked up larval plankton, ammonia, water ice and other, more complex compounds from the warmer depths, and the plankton fed and bloomed in the sunlight. When you traveled the relatively calm air between the storms you either didn't eat or you had to drop down very close to the cloud tops to scavenge what plankton remained. That meant you also became shark bait.

Sharks were creatures of the clouds and lightning-flashed darkness. They didn't like the sunlight and they couldn't take the cold and low pressure above the cloud tops as well as the High Folk. But then except for the plankton and remoras, nothing on Ensign's world could.

Because of Jupiter's high gravity and thick atmosphere, the pressure gradient went from three Earthly atmospheres at the melting point of water to a fraction of an atmosphere at temperatures well below anything on Earth in a matter of fifty miles. Compounds borne up out of the warmer, thicker, denser layers nourished the life in the cloud layers and the complex ecology down in the dark produced the tiny organisms borne upward to bloom and grow in the sun and feed the High Folk. Danger and food came from the clouds below and the life of the High Folk was a constant balancing act between avoiding the danger and sucking in enough plankton to fuel their huge bodies.

*Special problem for me,* Ensign thought glumly as he flapped his outer wings to try to hold his position. He had jetted so much hydrogen escaping from the shark that he was less buoyant than the others. Unless the Choir was very lucky at finding updrafts to glide from, he would have to spend more energy to keep up. With little food and the low pressure of high altitudes he wouldn't be able to build up his hydrogen reserves. Ensign's knowledge of thermodynamics was intuitive rather than systematic but he knew what that meant for his chances.

*Killer was right. Some of us aren't going to make it.* He only hoped that Teacher was as right as Killer.

The updraft topped out before they reached the limits of their altitude endurance and the Choir members peeled off, flattening their manta-shaped bodies to glide as far as they could toward the next cloud column that might mark another updraft. Behind them Ensign could see all the way to the milky center of the small cyclonic storm they were leaving.

He ignored the darker plankton fields around the edge and concentrated on the storm's dark central pool. The more turbulent the air, the richer the feeding, but get too close to the inner edge and you couldn't fight the wind. If the turbulence didn't batter you to death, or even if it did, you would eventually be sucked into the eye and hurled into the dark, crushing depths.

It was not an uncommon way for Ensign's kind to die.

The storm was a baby, only a few thousand kilometers across. In the next zone north was the monster of all storms, the Great Red Spot. They would cross well clear of it, but before they got there they would have to cross the stormy sky between the bands and that was nearly as dangerous. And beyond that there would be another band edge, and beyond that....

He shook himself. There was enough to do today without worrying about tomorrow.

"What are you thinking about?" Melody's voice cut through his reverie.

Ensign looked ahead at a cloud tower standing gold-tinged against the hazy blue sky. He focused on the pink and saffron clouds swirling below.

"I was just thinking what a fine day it is," he said.

The haze grew thicker as they glided down toward the cloud tops. Ahead the cloud column towered above them, blocking out more and more of the sky. Unfettered by the need to stay in thermals, the group spread out over several hundred wingspans, staying close enough to speak but with each member instinctively seeking the course that suited him or her best. Ensign let the others lead so he could judge the line of least energy from their glide paths. As pod leader, Teacher steered a fairly conservative course, Melody and Crystal tended to stay high and toward the middle of the pod; Droner was sloppy as usual; Yearling came down so fast and steep he had to drop his trailing edge occasionally to kill speed and keep from rudely getting in front of Teacher.

Ensign watched the youngster's antics with amusement. *Was I ever that young? Ever that full of life?* Probably not, he admitted. He was a plodder, steady rather than exuberant like Yearling or flashy like Killer. Still, he could appreciate both of them. He enjoyed watching Yearling, just as he enjoyed sharing The Geek's insights into all kinds of arcana or even, he admitted, as he had enjoyed Killer's dash and style back before things started to go wrong.

There was still a lot of admire about Killer, for all his faults. Ensign hadn't really liked him, but he had admired him. *Then why was it that the tension seemed to center on him and me?* he wondered.

It came as a new thought and he was still working on it when something else caught his eye. They approached the cloud column now, close enough to read the fine structure of the updrafts and swirling air masses by infrared. Teacher held them well off the cloud tops, but Droner had dropped low, lower even than Yearling at the bottom of his swoops.

*That's not right! He's too low.* For an instant a tendril of mist hid Droner and Ensign focused his tympani to shout. But Droner already saw his error. He angled up sharply, trading speed for height and climbing away from the opaque cloud mass. He broke free into the clear air, hanging for an instant, teetering on the edge of a stall. Then a dark torpedo shape lunged out of the clouds and slashed across Droner's underside.

Soundlessly, Droner crumpled in on himself. With most of his central gas cells torn he lost lift and rigidity simultaneously and began to flutter down into the clouds.

The sharks were tearing at him before mist closed over them. *"Nooo,"* Crystal screamed on all frequencies. Ensign's body tightened. He wanted to lunge down into the clouds and lash the sharks, blind and deafen them with his voices, to fight and destroy them utterly for what they had done to his friend.

But it was useless, suicidal. There was no hope. Even if the sharks had not been at him so quickly, no one could live with that many gas cells ruptured. Droner, with his warm middle ranges and complicated rhymes, his endless and near-pointless story-songs, was gone.

Without thinking, the pod had pulled itself into a tight defensive formation well clear of the clouds. There were rasps of grief and hums of shock, but no coherent communication. Even Simon had stopped his mumbling.

At last, slowly, painfully, the pod unwound from its box. Melody started the Mourning Song and they all joined in, bawling out their grief and anger to the uncaring clouds and endless, eternal sky.

They were lucky in their choice of a cloud column. The towering mass marked a strong updraft with a minimum of internal turbulence. As soon as the Choir rose smoothly and well clear of the cloud layer, Teacher summoned them into a classroom formation.

"We have songs to learn," Teacher called in the way he had summoned them to class. "New ones for all of you."

No one objected. One of them was gone and would be no more. They had mourned him in song and perhaps later they would mourn again in other, more personal, songs. But for the High Folk sudden death remained a constant and life always went on.

"... Bzzhum songs to learn," Simon breathed, "many, many, many ... hisss." Ensign wished the ancient would either shut up or move away from them, but it would be impolite to say anything, so he tried to block out the sound and concentrate on Teacher.

The Choir began to sort itself by sound range so the similar parts could stay together on a new song. Teacher stopped them with a wing ripple. "That won't be necessary. There are no parts to these songs."

"You mean we all sing the same part?" Melody sounded a little put off. She prided herself on the ability to carry a theme through the Choir's complex harmonies.

"On these, yes. Now, here is the first one." He hummed a simple rythym.

*"—To find the best fields when the Sun's sinking low. . . .*

"That's not a performance piece," Yearling protested. "That's a childrens' song."

Teacher stopped and focused his full attention on Yearling. "Do you know it?" he demanded.

"Well, no."

"Then learn it." He swept the group with an admonitory sound pulse. "All of you."

The whole Choir went rigid. "We're musicians, artists," Yearling muttered, "not children."

"And because you are musicians you can carry many more of these songs than most folk," Teacher countered. "Why do you think we teach these songs to children? Because they help us."

"Then teach them to children," Yearling shot back.

"Children are less likely to survive," Teacher said quietly. "These songs must live on with or without children."

The only sound was Simon's mumbling and the whisper of the winds as they rode the updraft. It wasn't just that the magnitude of what was coming was sinking in, Ensign realized, it was that they had always looked down on adults whose only repertoire was such childish songs. Skilled and talented as they all were, they hadn't seen them as worth studying.

"He's right," The Geek said into the silence. "Songs like this are tool songs. They help us to survive. We will need them and we must learn them."

"Wait a minute," Ensign put in. "You have a lot of these, right?"

Teacher bobbed agreement. "More than enough to keep us occupied for the rest of our trip."

"Well then, why not split it up and make each of us learn just a few of them?"

"No."

"But—"

"He's right," Shorty said quietly. "We all have to learn these songs. The odds are better that way."

Ensign started to protest, saw Shorty's point, and shut up.

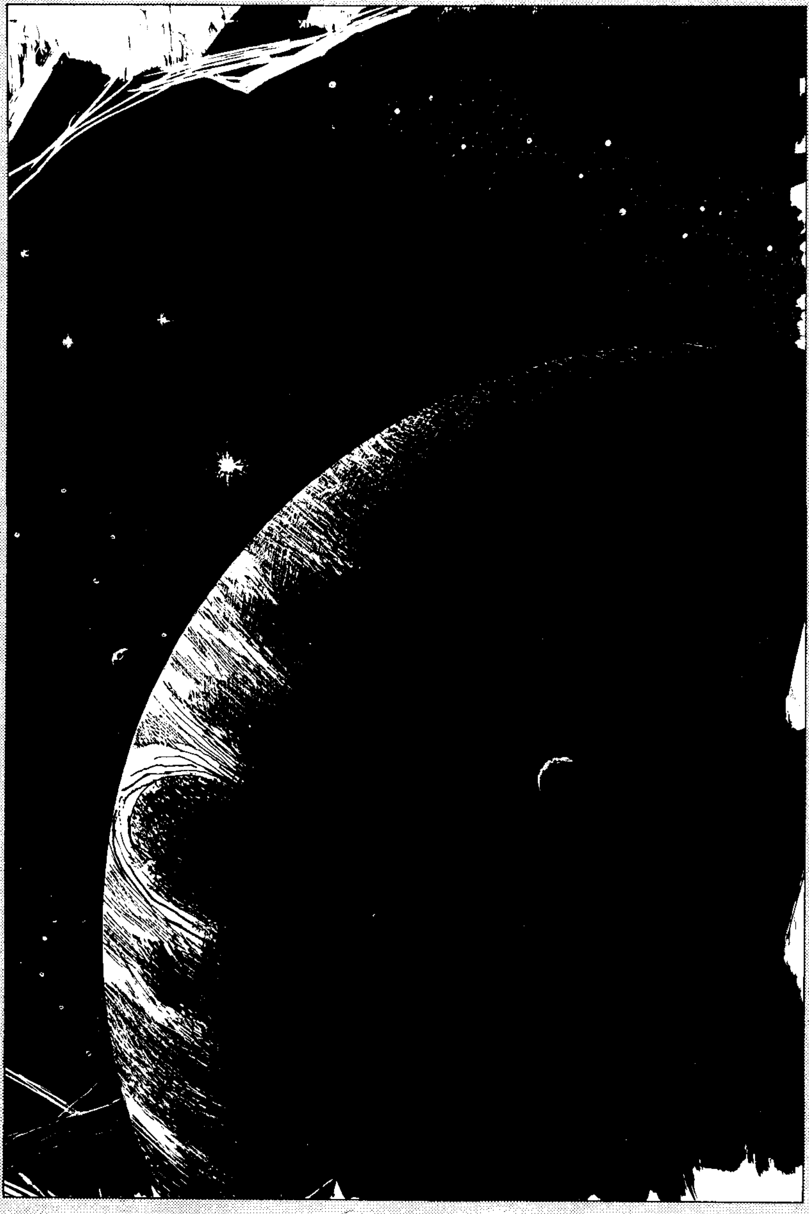
"Now," Teacher said as if he had not been interrupted. "Once again.

*To find the best fields when the Sun's sinking low. . . .*

They were lucky at finding thermals all that day and they rested for the night, floating well above the dangerous cloud tops. Ensign felt glad for that. While the distant Sun and the inevitable lightning below meant that there wasn't much difference in how well the High Folk saw at night, the end of the sunlight meant fewer thermals to ride. The fact that Teacher as pod leader and pathfinder was sparing them from the more strenuous night flying told Ensign of what he would expect for the rest of the journey.

The strange lights were still in the sky. Two sparks, one bright and one dim just above the horizon. They looked so inconsequential, he thought. Were they really worth fleeing? He could see that they had moved since the night before.

They followed the same travel pattern the next day and the day after that. Ride thermals, glide as much as possible, and rest during the night, all the while learning more and more simple songs by day and teaching them to the remoras at night. There was no time for feeding and not much to feed on. The rising columns of air



didn't reach far enough down into the atmosphere to bring up nutrients to support plankton.

By the fourth day hunger had become a companion. Ensign's remoras felt it as well, wiggling and buzzing in protest at their own hunger.

"We're going to have to eat soon," Ensign said to Teacher during a brief break in the learning.

"I have been looking for a feeding ground," Teacher said in his best pod-leader voices. "There is a place up ahead, I think."

Teacher's "place" turned out to be a cloud canyon with strong updrafts on both sides. The canyon bottom was darkened by plankton fed from the upwellings.

"Not especially rich, is it?" The Geek transmitted tight-band to Ensign as Teacher led them in.

"Richer than anything else around," Ensign whispered back. Neither mentioned the shark danger in a feeding ground surrounded by clouds.

Normally Ensign would have avoided a place with this kind of cloud topography. But the whole choir was hungry and he was probably hungrier than the others. There really wasn't an alternative.

As the pod closed in on the plankton field they instinctively sorted themselves out into feeding formation. Most of the group stayed to the center of the canyon, but the plankton floated thicker at the edges. Ensign weighed the situation and moved closer to the cloud wall, almost under the overhanging mass.

*This is dangerous,* he thought as he opened his mouth to start scooping plankton. Still, the richer feeding meant more energy and he had burned much more than the others.

The plankton here was thin and poor. It hadn't been in the sunlight long enough to grow and fill out so it was gritty with unexpanded parts. Ensign knew he wouldn't get enough nutrition out of this.

*Will I make it?* he wondered as he scooped in the tiny creatures that lay in his path. *Will I be one of the ones who crosses the bands?* His flanks pulsed as he forced the plankton-laden air through his feeding passage and expelled it through his side and bottom vents. Each pulse brought a little more food to be filtered out and a little more hydrogen to add to his store.

Like all his kind, Ensign remained a realist. He knew that of all the Choir his chances were probably the worst. The low hydrogen supply, the energy he had to expend and now this, feeding next to a cloud bank.

He tried to think positively, but the place oppressed him. Had his brush with the sharks made him more sensitive? No, scanning the pod he could see that everyone appeared nervous. Even Simon had squeezed his body down a little from the tension.

He also realized that everyone else gave the edges a wide berth. Shorty, who was next in on the feeding line, had left an unusually wide space between himself and Ensign, all the better to stay away from the cloud banks.

Just like Shorty, he thought. Always play it safe and cautious. He wondered why someone with that attitude had decided to come on this venture. Especially one who thought Teacher would use them up unhesitatingly in pursuing his goal. *Teacher's power?* Was Teacher's hold on him really strong enough to make Shorty go against his instincts? *I guess that's what he meant when he said Teacher is a great pod leader.*

Not that Teacher's influence had stopped Shorty from being careful and cautious. It was just like him to pick the safest course through the plankton field. *He'll make it,* Ensign thought. *If anyone makes it, Shorty will.*

Ensign probed the clouds with sound. Risky, because sharks could hear those probes. But it was even more risky to feed blind so close to clouds.

The clouds swirled close, glaring white and lemon yellow in the bright sunshine. Ensign found pale echoes from temperature and density discontinuities within them but no sign of anything dangerous. He continued to work his way along the edge, probing, feeding and feeling the tension grow within him until he wanted to scream on every frequency he could reach.

The plankton field was so poor that two passes would exhaust it. The pod reached the end of the cloud valley and banked into a group turn to make their final feeding pass. The formation left Ensign the low man and even more exposed. But it also meant he got a few precious more minutes of feeding time and a tiny amount more food. He held his course until he was almost into the mist.

As they came back on the new course Ensign continued to probe with his sonar. Again he stayed close to the cloud bank and Shorty gave him plenty of room. There was less plankton this time and it was more roiled by the currents of their passage.

The tension grew as they passed the halfway point in the field. Then three-quarters, then seven-eighths. Still nothing in the clouds but returns from discontinuities. There were more of them now, perhaps because the Sun was past its zenith and the clouds were cooling. They shivered and danced under Ensign's sonar probe, rising up gently or soaring quickly as was their nature.

*Soaring? Wait a minute!* His body contracted and he blasted out a warning, but already the sharks were on them.

*SKREEEE*

With a blare of hunting noise three sharks jetted out of the clouds. Not diving from the cloud banks, but charging up from beneath. Ensign rolled away instinctively and was instantly lost in the clouds. He could not see, but he could hear Shorty's despairing screams.

Without thinking he rolled into the opposite direction out of the terrifying clouds and into the light. The pod was already rising and closing up in a defensive box as one of the sharks pushed over and dove back on them from above. The other two had Shorty, tearing at his wing edges with their mouths full of ripping teeth. There was a huge ragged hole in his inner wing, but Shorty was still screaming as they sank back toward the clouds.

Ensign flattened his body and dove. The sharks had fastened on Shorty with a predator's intentness and didn't see him coming until one of them was sent spinning by a blow from his outer wing. The other twisted and snapped at Ensign. The thing missed and Ensign gave it a concentrated blast of sound as he went by. In the background he heard the pulse of sound as the rest of the pod concentrated their voices on the diving shark. And over everything else the screams.

The first shark writhed, obviously hurt, but it flicked out its wings and lunged at Ensign. Its mate left Shorty screaming and joined the attack.

But both sharks had expended their available hydrogen in their jet attack. Now they were slow and vulnerable. The injured shark's right wing only extended halfway so its attack came as a slow roll. Ensign held position until the last instant and then rolled out of its way. The shark's teeth caught his trailing edge for an instant and then Ensign's wingtip counterblow whipped it free and ruptured its main gas cell like a popped balloon. Damaged beyond hope and already dead from the concussion, the shark plummeted into the clouds.

The second shark was slow but Ensign's preoccupation let it set up its attack. It came in low and from behind only to fly straight into the most massive sound beam Ensign could emit at that angle. Three of his sounding chambers focused on the attacker and even his remoras added their sounds. For an instant the sound drowned out Shorty's screams.

Blinded, deafened and damaged, the shark blundered past Ensign underneath. It twisted, flicked its tail and started to turn back. Then it seemed to shudder, shrivel and collapse in on itself under a massive blast of sonar energy from the entire Bach Choir. Even out of the beam's focus, the wave of noise shivered Ensign to his core.

As the remains of the third shark dropped into the clouds, Ensign shook himself and tried to get his hearing back. The nerves in his active hearing chambers had been damaged by the Choir's blast, but they would heal. Almost without thinking he switched to auxiliary hearing chambers, and immediately wished he hadn't.

Shorty was still screaming, a despairing, high wail that quavered across frequencies and seemed to echo everywhere at once. He was already lost in the dirty yellow murk below them but his screams went on and on.

Without a word Teacher gave the signal for the pod to rise. Still in defensive formation, the Bach Choir climbed toward the now-setting Sun, up and out of the terrible valley in the clouds.

Behind them the screams faded and were lost in the everpresent whisper of the wind.

The curious points of light were brighter in the sky that night, one below the other. Even through the haze down toward the cloud tops Ensign could see them burning malevolently. Almost, he was too worn down to care. He felt numb from Shorty's death, tired from hard traveling and still hungry. *At this rate those things won't even have to fall to kill us,* he thought sourly. *The trip will do us in.*

He wasn't the only one. All of the Bach Choir drooped their wingtips and moved listlessly in the night currents. Only Teacher held himself in trim, but Ensign suspected that was more from a sense of pod leader's duty than a reflection of the way he felt.

Motion flickered below him. Ensign went rigid and then relaxed when he heard the hum of a message remora. The little creature folded its wings and nestled its torpedo-shaped body against a lower earmouth. Ensign felt a tickling as his other remoras rearranged themselves to make room for the newcomer.

The remora vibrated against his earmouth and he heard Crystal's warm trill. "Ensign, I need to talk to you! Come toward me and speak softly, privately. Please."

The remora detached and led him toward the outer edge of the pod where Crystal floated alone.

"Ensign?"

He saw her reflected in the soft glow from a lightning discharge far below. "Yes, Crystal. I got your message."

"Where's Simon? I can't find him."

"Look above you. When it got dark he floated up above the haze to get a better look at the things in the sky."

"I don't want to look up," she vibrated tightly. "I'm scared."

In spite of himself Ensign rolled slightly to focus his main eyes on the two bright sparks. Then quickly he rolled back to look at Crystal.

He rippled a grimace. "We're all scared. I guess you just have the courage to say it out loud." Desperately he hunted for something to add.

Crystal shifted nervously, "But what can we do?"

"We're doing it. We're learning the songs and we're going north."

"Oh," she said in a very small voice. "Nothing else?"

*There ought to be something I can tell her,* Ensign thought desperately. *Some song of wisdom to help her face this.* But nothing came. He felt tired to his inner core and completely inadequate.

"Nothing else. I'm sorry."

"I asked Teacher," Crystal said quietly. "He said the same thing. Only I was hoping you—" She stopped and trilled a nervous little laugh. "Well, never mind. Thanks."

She drifted away, borne on a gentle current, leaving Ensign puzzling in her wake. Teacher at a loss for words of wisdom and comfort? That was a new thought.

*I wonder if he ever feels inadequate?* he thought, looking at where Teacher floated, trim and composed. *Is it that he always knows what to do or that he knows how to hide his doubts?*

The rising Sun tinged the clouds with purple and red when Simon drifted down to join them, humming songs of the sights he had seen. In spite of his night's work, Simon appeared the freshest and sharpest of them all as they began the last leg of their journey to the Edge.

As they milled about waiting for thermals to form, Ensign moved toward Teacher. In spite of his fatigue there were a lot of things he wanted to ask. But Teacher took Simon off to the side for an animated discussion. *Almost like they are arguing,* he thought. And that was a new idea too.

From the top of the first thermal Ensign could see the edge of the South Temperate Zone. Later today or tomorrow they would pass through the swirling currents of the edge and into the South Temperate Belt. Unlike the zones, where the air currents generally flowed upward, the winds in the belts were mostly downdrafts. Not heavy downdrafts mostly, just as the updrafts in the belts weren't heavy, but it meant wing flying all the way. No more thermals to help them along and almost no plankton. Ensign didn't want to think about what that could mean in his condition. Well, he'd just do the best he could and hope. Looking at the other pod members, Ensign felt they weren't in much better shape.

He looked ahead to where Teacher and Simon flew almost head-to-head, still deep in conversation. Simon appeared as rigid as he had ever seen the bloated oldster and Teacher seemed to be speaking forcefully. Well, nothing he could do about that, or about what lay ahead. Best to enjoy today and leave tomorrow for tomorrow.

They had good thermals in the roiled air near the edge so they arrived at the outer mixture zone early in the afternoon. Instead of casting about for the best crossing place Teacher called them all together.

"We will rest and feed here for a few days before we cross," Teacher told them as they assembled in loose pod formation. "Eat as much as you can and gather your strength. This will probably be the last break on our journey."

"Foolishness," Simon vibrated half-out-loud from his place next to Teacher. "Skyfall comes. Foolisshneess . . . buzzzhmmm."

Ensign didn't know if Simon meant to be heard or not, but the whole pod had heard.

"A calculated risk," Teacher said with a ripple of his trailing edge. "We sacrifice distance to gain strength. Dangerous, but less dangerous than trying to cross the belt in our present condition."

"Skyfall comes," Simon repeated.

"And when it comes conditions may be too disturbed for good feeding," Teacher replied. "So we must feed now." He swept over all of them. "We have had a hard trip, harder than I imagined. Now rest and gain strength."

"How long will we stay here?" asked The Geek.

Teacher rippled a shrug. "As little time as we can. So feed well."

For the next three days the members of the Bach Choir grazed in the rich plankton of the mixture zone. The swirling updrafts and downdrafts produced an especially heavy bloom, sharp with strange, rich flavors. There was so much the pod was able to stay well above the cloud tops, away from the lurking sharks. And all day and all night, feeding and resting, they learned more songs.

For three wonderful days they basked in the Sun and gorged themselves on the zone's bounty. Ensign grew stronger and his hydrogen cells grew tight with fresh gas. The pod's mood lightened as they left the rigors of the trip behind them and the perils of the trip to come receded into the future.

But Simon mumbled and fretted and fidgeted. Each night they could see the sparks of skyfall-to-come growing larger in the sky. In spite of the rest and food Ensign was glad when Teacher called them into traveling formation at the fourth dawn.

In the glare of full sunrise they headed north again, dodging through the swirling currents where belt met zone. The storms Killer had predicted were absent, but it was tricky going nonetheless.

"It may take us all day to pass through the boundary between this zone and the next belt," Teacher told them at midday. "We can generally handle the cross-currents but we have to watch out for the downdrafts."

"And now you're going to ask for a volunteer to fly ahead," Yearling interrupted, "the strongest among us."

Teacher swept Yearling with a disapproving burst of sound. "Each of us will take a turn seeking downdrafts. For no more than a day-tenth at a time. I will take the first turn." He swiveled toward Yearling, "And you will be next!"

Ensign and the others plodded on in a loose gaggle behind their leader. There was a little plankton in the jumbled eddies of the inner band edge. Without the steady updrafts of the mixture zone the fields were small but a traveler with keen senses could partially replenish himself. He felt a bit smug and toyed with composing a song teaching the technique.

Ensign felt the first tentative gusts and swirls of winds toward the west, and marveled that he was actually about to cross one of the boundaries of his world. Not many of the High Folk ventured across more than one band, but some had and their songs were the stuff of legend. Would he become a legend? For that matter, would he even survive? As a singer Ensign knew the two were not mutually exclusive.

"Your turn, Ensign," Teacher called out. Ensign pulled ahead of the loose formation as Melody dropped back, wingtips sagging slightly from fatigue.

He barely had time to get in front of the group when he ran head-on into a powerful downdraft and dropped several wing spans before he could even react. He called for the group to detour and started the long, hard climb back to a safe altitude.

It was a sign of things to come. There was nothing but downdraft after downdraft. The songs he had learned in the Zone didn't help him much in a place where the air currents tended down instead of up. As a result he blundered from one downdraft to another, wishing all the while for one of those despised childrens' songs to help him.

The first downdraft wasn't so bad,

or the second or the fourth, but by the tenth or twentieth, flying became grueling work and his body ached with the effort. He looked at the Sun and found he'd been leading for only half a day-tenth. He signaled and once again strained upward with full beats of his wingtips.

Gradually they moved through the turbulent inner mixture region and out into the outer region on the other side. The winds calmed and steadied but the downdrafts came closer and closer together until they seemed never to end. The day blended into a haze of sudden drops and tedious climbs. At the very end of the day, when the Sun had been heating the clouds for the maximum time, he found a weak updraft, one the entire pod could relax in. Almost no plankton, of course, but he was happy for the chance to rest his wings.

They rested for a while until the updraft dissipated in the cooling atmosphere and flew on in the night. No point in traveling only by day in a place where there were no thermals to speak of.

As two moons rose in evening twilight the pod struggled north. The atmosphere calmed considerably away from the band edge and the sudden downdrafts decreased. But the general flow of air was still down, gentle but relentless. They had to keep flying to hold their altitude.

Simon flew close to Ensign as they labored along. "Tomorrow," the old one mumbled, "Come tomorrow. Never anything like it. MZZZ. Basssssh."

"Excuse me?"

The ancient observer gestured up in the dim light, "See that? It has a tail!"

Ensign looked at the now-familiar objects in the sky. The smaller one remained a bright dot, bigger than the night before, but the larger, closer one had changed.

Now the brilliant spark appeared surrounded by a hazy circle of cloud, streaming away from the Sun in a wispy line. "What does it mean?"

Simon turned to him, "Tomorrow—just before sunrise—the world will change. That," he bobbed a wingtip skyward, "will hit us."

Ensign went rigid with alarm. "You mean it will fall on us?"

The oldster gestured sharply. "Not on us. But it will fall. And then the one behind it and the one behind it. One by one they will all fall."

Ensign flew on to wait for dawn. Occasionally he looked up at the strange glowing object and finally decided it was moving Eastward. Simon was right. It would not fall on them.

At first light, Teacher pulled the Bach Choir close together. "We should be close to the boundary of the South Tropical Zone by nightfall. As we cross we can feed in the updrafts, but we will not stop again. From now we must press on day and night as long as our strength lasts."

"Are we sure the Red Spot isn't near?"

Teacher bobbed reassuringly. "It is on the other side of the planet. High Folk have lived in that zone for millennia. They track it carefully."

"One less thing to worry about, anyway," The Geek muttered on a low frequency. Ensign didn't know if he was supposed to hear it or not.

All through the day they pushed on. It was still slow, exhausting work, excruciating for the leader but bad for all of them. Fortunately all of Bach Choir was young and strong. Ensign realized that no regular pod could cross a belt at anything like their speed. He wondered how the Old One could endure.

The Sun wheeled in the sky and set in a mass of fiery clouds. Still the group flew north, seeking the respite and dubious safety of the zone boundary. As the night wore on, Ensign kept looking to the west. He was not the only one.

It was nearly dawn and Ensign had just taken the lead when it happened. Far to the west a thread of blinding light lanced out of the sky. Brighter than lightning and straight as a diving shark, so bright it appeared purple at the edges. Ensign flinched away from the brilliance and screwed his eyes tight shut. Still the image burned in its retinas.

"It has begun," Teacher said.

"No sound," Melody said wonderingly. "There wasn't any sound."

"Too far," The Geek told her. "It was so far and yet so bright." For a moment the only sound was Old One's mumbling.

"Come," Teacher called them back from their reveries. "The next one may be nearer. Ensign, you have the lead."

Wordlessly, Ensign turned north again. They approached the edge now and the air currents became more irregular and harder to avoid. He dodged two downdrafts only to be swallowed up by a third. He fought his way clear with powerful beats of his wings and a few moments later he broke out into strong, clear dawn light. While the others climbed up to him he looked around.

To the east was the normal rolling plain of clouds, purple where still in shadow, shading through rose and flaming crimson to pure clear whites and yellows at the tops fully in the sunlight. But there was something wrong with the sunrise. Off in the west a peculiar white sheet, flat and featureless, was spreading from horizon to horizon. Spreading quickly too, he realized. As he watched, it gobbled up cloud masses and rifts alike, churning them into flat white blankness. There was something about that....

"Um, Teacher?" he called.

Teacher turned to the east and his body went rigid. "Shock wave!" he roared on all frequencies. "Expand your—"

And then the Universe went white.

First came the pain. Pain everywhere. Searing, numbing pain in his timpani, his earmouths, his gas cells, pain everywhere on and in his body. He let the pain wash over him, unable to move or even cry out in his agony.

Next was his breathing. Great sucking gasps of hot, foul-tasting air passing through his body. Again and again, pain shooting through on each one.

Then at last, volition. Deliberately he took conscious control of his nervous system and blotted out the pain signals. He drifted upside down, he realized. Dead and flailing remoras floated nearby. Some of them his, some from the others.

The mist cleared slowly and he saw Teacher nearby. "What. . . ?"

"It has begun." Teacher's voice sounded strained and strange. Either Ensign had lost his hearing on half the frequencies, or Teacher had lost half his voices. "The skyfall. Come. We must go on." Teacher made a wobbly turn toward the North, but his strength and coordination had both failed him.

Ensign looked around. Some of his remoras reattached themselves to him. Others wandered dazed, making mewling seeking cries as they tried to find a host. He looked down at the flat white world below. They flew hundreds of wingspans above the cloudtops, thrown there by the shock wave. Most of the pod members wobbled back to consciousness or moved in tight little circles. Somewhere behind him he heard Yearling moaning in pain.

Down below Ensign saw a dark spot above the whiteness. In spite of the pain he forced himself to focus on it and the spot suddenly resolved into Crystal. She drifted down limply with one wing oddly angled.

"Crystal? Crystal!" But she did not respond. As she fell closer to the shark-filled clouds he called again but she did not stir. When the whiteness began to close around her he flattened himself for a rescue dive.

"Ensign!" Teacher called sharply, "Let her go!"

Ensign ignored him. He angled down and prepared to dive, but Teacher moved in front of him.

"She is already dead," Teacher said quietly. "Leave her."

He stared down, trying to track her in the clouds. Suddenly a shark jetted up from the whiteness, ignoring Crystal's drifting body. At the top of its arc it twitched uncontrollably and fell, flailing back toward the clouds, bent and broken.

*Gone,* he thought numbly. *Just gone.* For an instant he wondered what had happened to Killer and Drummer and the others. Had they been far enough away?

Teacher called the pod into a shaky parody of traveling formation. Somewhere on the flanks someone began the song for the dead, distorted by loss of hearing or voices. No fancy figures this time, no subtle harmonies. Just the keening monotonous drone of the Mourning Song, fuzzed and blurred by their injuries. With the damaged song echoing among them, the damaged pod limped north again.

The mist rose far above them, dimming the light and setting sundogs and rainbows around the rising Sun. As the day wore on the Sun's heat seemed to help sort the world out. The mist began to thin as the roiled atmosphere settled itself. Twice they saw sharks below them, drifting aimlessly. *The ones at the deeper levels must have suffered worse because the pressure was higher,* he thought dully. But he did not say it. No one spoke. They only sang with mindless intensity, trying to blot out the unabsorbable enormity of what had happened.

The foggy dimness suited Ensign. The pain eased though every part of his body still ached, and the numbness faded to anger. He hated the sharks, the things in the sky, the fates that randomly took his friends, the journey, and half a dozen real and imagined hardships.

The Sun lay on the horizon when Teacher broke the death song. "I think I feel the winds nudging to the east. We're approaching the South Tropical Zone. Can anybody else feel it?" Ensign said nothing, lost in his own pain and self-pity.

"Things seem to be more normal here," Teacher continued, as if oblivious to the pod's mood. "The skyfall's effects are damped by the boundaries. That's important, remember it." Then he turned to Ensign.

"Ensign, you take the lead. It feels like mostly updrafts here."

The truth was there hadn't been updrafts or downdrafts since the shock wave, but he grudgingly moved ahead, senses only half alert.

Teacher was half-right, Ensign grudgingly admitted as he flapped through the mist. Things did seem more normal here—or as normal as they got in the confused, swirling air of the boundary zone. The mist had definitely lightened. The air still smelled horrible and there was a slight wind angling down, but it was as if the patterns of swirls and eddies were forming again.

Now the mist seemed a bit thicker. "Climb?" Ensign asked Teacher.

"Not yet," came the buzzing reply. Then a pause as Teacher and Simon consulted. "Conditions are too unsettled and we probably cannot get above it."

The mists were definitely getting thicker and in spite of his black mood, Ensign became more alert. With so many of his hearing chambers damaged, his sonar wasn't functioning well, but he listened intently for sharks. Perhaps the sharks had been hurt worse than the Bach Choir by the shock wave, but flying in clouds still felt wrong.

The angled downdraft became a little stronger now but still nothing like the downdrafts he'd dealt with for days. He ignored it and sounded the mists ahead. The echoes showed suddenly clear air within a wingspan or two. He pressed on, seeing the skies brighten before him as the mist thinned.

Then suddenly he broke through a wall of cloud and into clear light and horror.

Before him the ruddy ocher of the Great Red Spot fell off into unimaginable depths. The gigantic storm swirled from horizon to horizon, yellow shading to orange to dark, evil black at its enormous center vortex.

"Red Spot!" Ensign screamed on all frequencies. He beat his wings frantically trying to break away from the monstrosity. But the wind picked up and already he could feel the air sliding him down the funnel side of the Solar System's largest hurricane.

"A new Red Spot," Teacher sang out, "fruit of skyfall!"

In an instant of panic-clear revelation Ensign realized what must have happened. There had been two skyfalls last night, the one to the west and one to the north, just across the boundary in this zone and perhaps a little after the first. The convection currents of the zone had shielded them from the shock wave of the northern strike and all day they had been blindly flying into its jaws, seeking safety.

Ensign stared, fascinated and frozen, into the maw of Death. Then Teacher's voice broke the spell. "Back into the clouds! This thing swirls to the east. Climb and fly east. Let it carry us around to the other side!"

Ensign winged over and dived back into the whiteness. A dark shape loomed in front of him, almost close enough to touch. He swooped below to avoid a collision. "Fly east!" he shouted as he passed.

It became a nightmare. The pod crabbed into the following wind, letting it bear them around the circle but always trying to fight their way to the outside, away from the deadly center and the ever-increasing winds. Clouds swirled around them, stinging with needle-sharp ice crystals and bitter with the taste of foul compounds sucked up from the depths. They dived to gain speed and used the speed to move away from the center. Then they climbed by flapping since expanding their gas cells gave them a bigger cross section and made them more vulnerable to the ravening winds. Usually they gained nothing to the outside, only holding their own and sometimes losing precious distance. Sometimes they were able to get a few wing spans farther out. Over and over again they repeated the cycle and always the remorseless winds pushed them inwards.

Teacher led them on, seeming to pause by each one in turn, murmuring encouragement to keep the formation together in the gloom. And always east, turning east.

"Shouldn't we try to climb into clearer air?" Ensign asked when Teacher came near.

"It won't work," came the strained reply, "If we climb our velocity vector won't be outward and we'll be sucked into the center. We can fly out or we can fly up but we don't have the strength to do both." Then he flapped away in the gloom to encourage someone else.

On and on they pushed into the murk, driven by tailwinds and their own flying. Ensign knew they must be making tremendous speed but the roiling clouds gave them no landmarks save the huge turning funnel on their lee. Sometimes he could hear Teacher sounding the clouds before them but his damaged hearing could make little of the returns. Occasionally he would catch a glimpse of another pod member, or hear Simon wheezing along behind him, but most of the time he struggled on alone.

Day may have turned into night and night back into day. In the clouds and darkness it was impossible to tell. All Ensign knew was that the flight seemed eternal.

"Ensign, we are near!" Teacher loomed up out of the dark behind him.

"Near?"

"The band edge! This spot must be

turning at a furious rate. We've reached the edge much sooner than I expected. If the winds are this high, the turbulence will be much worse."

Ensign felt he had no strength left at all. "What about sharks in these clouds?"

Teacher managed a chuckle. "Sharks are too smart to be caught in something like this!"

Ensign felt the first tentative crosswinds just as Teacher cried out. A gust nearly tipped him on his side as he heard Teacher shout hoarsely, "Turn right! Dive if you must. Vortex cell. . . ."

As Ensign dropped into a descending turn he heard Teacher moan in pain, then a startled grunt from Simon. The roiled clouds thickened until he could not even see his wingtips. Teacher moaned again, nearby. Ensign saw a dim shape off to the right and was about to call out to Teacher when he recognized Melody, flying strongly. Then to the left and above he saw a struggling form. As Teacher approached, Ensign saw the broken wing which had bent double, the wingtip neatly slicing into vital gas cells. Remoras formed a cloud around him as they abandoned their dying host.

Frantically he gathered Teacher's remoras to him, trying to save as many as possible. The remoras moved uncertainly, confused by the winds. Ensign saw one sucked away by the storm before it could even spread its wings.

Teacher focused on Ensign and for the first time seemed to realize who was with him. He tightened his skin as if to say something. Then he was whipped away, gone in the howling orange murk.

Survival instinct took over. Ensign climbed and climbed against the winds, laboring under the added load of the remoras.

Somehow, sometime, the awful winds began to steady and die. Eventually he heard the pod call ahead and to his left. Almost automatically he turned toward the sound and struggled out to meet the others.

He was the last to make it. Everyone else had formed a loose box to call in all directions. Everyone but Teacher.

"We were afraid we had lost you," Melody said as he slid into the formation. Her voice sounded unreal, lacking in the overtones in his damaged timpani. "Teacher?"

Ensign only bobbed negation.

Numbly they began distributing Teacher's remoras among the other pod members. That done they milled aimlessly for a while. Then, because someone had to do it, Ensign moved to the front and signaled them into flying formation.

Once more they flew north. Lesser gusts flung them farther from the center of the Red Spot and buffeted them repeatedly. Once more they sang the Mourning Song, now thin and ragged in their fatigue and exhaustion.

At last they emerged from the clouds and into still air. It was evening, Ensign noted. They had been caught in that maelstrom for—how long?—one day? Two days? Three? Battered and exhausted, what was left of the Bach Choir tried to rest.

"Look!" Melody said, tilting skyward. There, hanging above them, one below the other, were three malevolently glowing sparks. Already the first two were surrounded by the bright haze that meant they were ready to fall.

"One after the other," Ensign said dully. "One after the other."

Before dawn one of the glowing sparks disappeared below the horizon. Ensign decided to turn farther north and was about to call out when the whole southwestern horizon lit up. A second later Io blazed bright enough to cast shadows on the cloud tops below. Instinctively the pod huddled together in a defensive box, as if it were a shark and not some force of nature.

As the eerie light died Simon expanded and floated up, trying to get above the haze to get a better look. Ensign didn't want a better look. He'd seen all of those things he ever wanted to see and then some. Ensign braced for the brutal shock wave but it never came.

To take his mind off what was overhead Ensign began to sort through his load of remoras, both his and the ones that had been Teacher's.

It was an odd experience. Some of the remoras had obviously been with Teacher for many seasons. They still felt of his body and moved uneasily on their new host. Feeling them against his skin was as if Teacher remained with him and he was invading his teacher's most personal feelings.

The remoras' memories reflected their former host. Most of them had very large memories, crammed with songs. There were some with songs he recognized, some with parts of songs, some with student exercises, and a few with what must have been Teacher's own works in progress.

*He never composed much,* Ensign thought sadly. *Instead he taught.* Somehow that made him feel even more lost.

As he worked his way through the remoras, one wiggled ahead of the others and clamped itself to an earmouth. "Ensign."

Teacher's voice! "If you are listening to this it is because something has happened to me." Even through the buzzing voice of the remora Teacher's personality shone out. It was as if Teacher hovered protectively above and behind him.

"As pod leader you will have a lot on your mind. But there are some things you must pay special attention to."

*How did he know?* Ensign wondered. *How did he know I'd take leadership of the pod?* He realized he had missed part of the message and he ordered the remora to go back. The little symbiote buzzed irritation but it complied.

"First, you have the leader's songs to learn. You will need the tools so they are important. But remember the tools are guides, not commands. Compose your own song as you go."

*Like the shark attack,* Ensign thought, remembering the time—how long ago?—when the second shark had not behaved the way the song had said.

"One other thing," the voice of the dead teacher continued. "Listen to Simon. He mumbles but he is a master navigator. And take special care of Simon's remoras. They hold the songs of prediction of the Newcomb Pod."

Even through the remora Teacher's voice sounded as warm and rich as ever. "Goodbye Ensign. And thank you. Go well."

"Goodbye," Ensign murmured. "Goodbye and thank you." The remora nestled on his earmouth buzzed a reply, as if the thanks had been meant for it. Which it was in a way, Ensign realized.

At dawn Ensign gathered the small group and started north again. They slowed when they found a sparse plankton field and all of them fed eagerly. They were still feeding when they felt, more than heard, the low rumble of a shock wave filtered by the wall of the band edge, many day-tenths after the actual impact. Ensign began to believe they would escape the holocaust described in the original Skyfall song.

The Geek floated close to him. "I've been thinking," he began in his geekly way. But he said it in an unusually serious manner.

"What's the problem?"

"Not a problem yet. But it could become one. If we lose any more members there won't be any choir."

Ensign forced himself to think about things he had been avoiding. "Then we'd just be remora carriers."

"Worse than that. Where once we were twelve, now there are only five—Melody and Yearling are strong but we have Simon—not exactly renowned as a voice. Have you taken pod inventory?"

Ensign bobbed negation.

"We're all just about maxed out now," The Geek said quietly. "None of us can carry many more remoras and the ones we've got are nearly full. If we lose very many of them we won't have enough memories to form a coherent body of information. All we'll have will be fragments."

"No more choir."

"Maybe no more pod."

*Killer was right,* Ensign thought as The Geek floated away. He hated the idea but he knew The Geek told the truth. The reason he hadn't taken pod inventory, he admitted, was because he'd been afraid of what he would find.

He had barely begun to ponder the implications when Simon descended and moved up beside him.

The Old One appeared in awful shape. He held his body oddly and his mouth worked convulsively. He had never looked healthy and from a distance he didn't look any worse. But up close the changes were obvious. Ensign flew closer and said privately, "Simon?" The huge ancient didn't respond. "Simon, are you all right?"

Simon wallowed, almost unable to control his attitude. "A choice," his voice rasped on Ensign's damaged hearing. With effort he continued. "I have seen and I have sung the predicting songs." The oldster quirked his trailing edge in a ghastly attempt at a smile. "The outcome is both good and bad."

"Start with the good."

"Skyfall ends. One, two more days

no more."

Ensign relaxed from a fleeing posture he hadn't realized he was holding.

"But before then you must choose."

Ensign tensed again.

"The next skyfall will be close, much closer. We can run west and put many more thousands of wingspans between us and skyfall."

"The other choice?"

"Run north for the boundary and try to cross before skyfall. The boundary will protect, a little."

Ensign did a quick estimate. They were fairly close to the band edge and its protection. "What's wrong with that?"

Again Simon quirked his trailing edge. "Impact between us and the boundary. If we move quickly we reach the boundary before skyfall." There was no need to ask what would happen if they didn't.

"Can we compromise? Run north and west?"

Simon snorted. "Worst of both. All downdrafts and no protection from the boundary."

"Well, what do you recommend?"

"Pod-leader's choice," Simon replied. "Not mine . . . bzzhmmshshhs."

Ensign left Simon buzzing and mumbling and flew on ahead. In spite of the closeness of his pod mates and his heavy load of remoras the sky became suddenly a very lonely place.

*Ask the others,* he thought. That was the way Bach Choir had always decided things, by discussion. He remembered warmly those long discussions and the slow forging of consensus. That was one of the things that made the Bach Choir so special. Almost, he turned to call the Choir together. Then he stopped. He also remembered how many day-tenths had been spent in argument and decision-making. Even if the process resulted in a better decision they didn't have time for it now. A fast, not-so-good decision was better than a slow, nearly perfect one. *Pod-leader's choice,* he thought sourly. Teacher must have felt like this when he let us stop and feed before the first skyfall.

Hunger played a part in his choice. The zone they crossed was sparse. Going west wouldn't help that. North through the danger zone at least led to plankton.

"We're going north," he told the pod after he called them together and explained. "We're going to try to beat skyfall."

He had expected some argument, or at least grumbling, but the others accepted his decision without comment. Things had changed among the members of the pod, Ensign saw. He wasn't their pod mate any more, he was their leader. He wasn't sure he liked the change.

Ensign set the pace as fast as he dared. Not fast enough for his liking but he had to consider the others. If they held this speed they would be across the boundary and into the South Equatorial Belt before time of skyfall. Not far enough across to suit Ensign, and Simon could only give a range of times for the next skyfall, but across.

*If we hold this speed,* he thought

as he flapped along in the lead, alert for downdrafts.

That was the problem. They were all tired from their struggle against the new Red Spot and this speed would exhaust them. If the boundary were unusually turbulent they could be in trouble even if they reached it well before skyfall.

*No good choices—again.* There were the new worries as well. As leader he had to keep the pod together, make sure they traded off pathfinders often enough not to wear down prematurely, encourage stragglers and watch for shark-bait situations. When he could, he reviewed the pod leader's songs for advice.

But mostly he just forged ahead, wing stroke by laboring wing stroke. Ensign could not see the comet streaking in above them in the light of day but he could imagine it.

They flew day and night, dodging downdrafts when they saw them in time and fighting through them when they did not. The trip became an endless, aching nightmare as they raced north.

As they flew, Simon fell farther and farther behind. Ensign dropped back under the excuse of asking Simon how soon the comet would strike but the doddering old observer could only answer, "Soon!"

Ensign surveyed the oldster critically. He looked even worse than he had when they started their dash. His wings beat slowly and occasionally he lost rhythm. Clearly he approached the end of his strength.

The logical thing to do was to leave him behind to take his chances. Ensign thought. Part of him was shocked at how cold-bloodedly he considered the idea. He remembered what Shorty had said about being a pod leader.

The same part of him cold-bloodedly rejected the idea. They had lost too many pod members and too many remoras already. They couldn't afford any more losses. So Simon had to be brought along. But that meant risking the whole pod being caught in the next skyfall.

*Pod leader's choice again.* Skies Above, he came to hate those!

Ensign called Yearling back to him and met him halfway.

"We're going to string out," he told him. "Simon's having trouble."

"And you want the strongest flyer among us to shepherd him," Yearling said calmly.

The youngster had already sized up the situation and accepted it, Ensign saw. *He's growing up,* he thought. But he only nodded.

His first instinct was to take the lead, the pod leader's traditional position. But he remembered Teacher's admonition and remembered that the pod leader always took the most important post.

"Geek," he called ahead, "you and Melody trade off in the lead and sing out the soundings. I'll stay between the groups and relay them back."

It was a compromise and like all compromises, fundamentally a lousy choice. But like most successful compromises it was the best lousy choice in a lousy situation. He settled in to the exhausting work of flying north.

Gradually a dark line emerged on

the distant horizon. It thickened and widened until they could see it was the band edge disturbances. Abstractly he was even glad for the increasing downdrafts and turbulence.

Concretely, the bad air only added to his problems. As the going got rougher Simon and Yearling fell farther and farther behind. Ensign had to drop back to act as a relay until finally both the group ahead and the group behind were just specks that could only be reached by low-frequency sound.

After several day-tenths, Melody reported that they had reached the zone edge and they were searching for a calm place to cross.

"Just cross," Ensign snapped back, "We'll meet on the other side." He looked back at the two distant specks that were Simon and Yearling. Once again he looked upward in vain for the comet. Simon had told him he wouldn't be able to see it in daylight, but he felt it hanging over him anyway.

As the air became more turbulent the clouds swirled up about them. He lost sight of the following party, first occasionally and then almost all the time. His only contact with them remained low-frequency sound and that became intermittent.

Ensign wanted desperately to turn back to them, to hurry them along and for the simple comfort of being close to others of his kind. But reason, and the pod-leaders songs, told him it would be useless. He could do nothing for them and if all three of them were lost the Bach Choir was utterly destroyed.

Ensign had lost contact with Simon and Yearling and he had just dipped a wingtip to circle around and call for them when the southern horizon blazed up brighter than the Sun.

Skyfall! Half by instinct and half by reason Ensign angled upward and jetted hydrogen, climbing desperately. He broke out of the mists and something seared his back and rear. He kept his rear eyes tight shut but he was nearly blinded by brilliance behind him.

*Don't look back. Whatever you do, don't look back. And climb. Climb for everything you are worth. Climb for where the air is thinner and the shock wave less intense. Climb, climb and don't look back.*

He was still climbing when the shock wave took him, shaking him in its jaws like the biggest shark ever. Ensign rolled and tumbled mercilessly. He felt his wings strain forward almost past their limits from the pressure and his whole body compressed and resonated from skyfall's blow.

And then it was over. Most of his hearing was gone, his muscles were torn and sore, but he was alive. A few remoras that had been shaken loose hurried to reattach themselves. Down below the world had been reduced to the now familiar flat white plain. Gingerly, favoring his left side, he turned toward the north and began the pod leader's call.

It seemed like forever before he heard The Geek's answering call ahead of him. Ensign didn't know how long he had been calling. The Geek's voice sounded tinny and strange in his damaged hearing and he knew he had lost some important frequencies.

He could feel pain in his burned outer membranes as he heaved his wings to rejoin his pod. He could hear The Geek calling to Simon and Yearling. Their voices came closer and closer until he finally broke out into clear air. Off to his right the two flew a wide formation. Melody trilled greeting and The Geek continued his call.

"You're hurt!" Melody exclaimed as Ensign approached.

Ensign took up formation as leader and replied, "I'll live." The Geek kept calling.

Ensign pondered for long wingbeats while they flew an elongated figure-8 over the blank whiteness, listening in vain for Yearling or Simon. Or more correctly, the others called and listened. With his damaged hearing and skin Ensign really wasn't up to either.

"Do you hear anything?" he finally asked. The Geek rippled negation.

"Give it up then." Off to the side he saw Melody start, as if in denial. She may have moaned. He couldn't hear.

"One last call," The Geek said simply, "—if only to the empty winds."

Ensign nodded.

The Geek sounded Last Call, focusing down in the lower frequencies and using every bit of energy he could put into his vibrating membranes, so much that a few of his remoras shook loose and flapped around him in a cloud. Even with damaged timpani, Ensign thought, if he kept singing that clearly, he'd become a Master.

Ensign began the wide sweeping turn which would continue their journey north. His lower eyes spotted a dark shape in the mists far below. "Possible shark, low and to the left—pretty far away."

Melody and The Geek fluted acknowledgement. Ensign probed the swirling clouds and saw it again. It was the largest shark he'd ever seen. Perhaps this band had huge predators. It certainly had the distinctly dark coloration of a shark. It rose out of the clouds Ensign stared, perplexed. Whatever it was had the shape of one of the High Folk and the skin of a shark.

Melody exclaimed, "It's Yearling! He's been burned darker than you, Ensign!"

"Bach Choir—to me! Anybody!" Yearling's call was reedy and thin.

Ensign pulled a wing-over and dove for his pod-mate below. "I'm coming. Turn toward me!"

Yearling's voice, rasping, floated up, "I'm blind in my upper eyes. Can't see a thing. Overloaded with remoras."

"Simon?" The Geek called out. His voice sounded blurred by the wind as he, too, dove to meet Yearling.

Yearling sighed in the lower registers, "He didn't make it. I got his memories."

Ensign and the others leveled out even with Yearling, who immediately began shaking off a cloud of remoras. They attached themselves to The Geek, Ensign, and Melody. The three High Folk, burdened with the memories of seven, had to stroke their wings to maintain altitude. Ensign looked at Yearling, battered and scarred, burned to a dark outer shade and said, "You've lost all your remoras! Take back the basic ones—you'll never be able to keep up without them!"

Yearling quirked his trailing edge. "Don't need 'em where I'm going."

Melody screamed, "Yearling! . . ." But Yearling only sighed in the lower frequencies and rolled away, exposing his underside. Instead of a smooth aerodynamic surface it was lumpy with ruptured and burned gas cells. Charred skin hung in tatters where one or two cells had burst to the outside, but most had broken inward causing massive internal damage.

As they watched in horror Yearling inverted into an easy, gliding dive. Then he started to cartwheel and tumbled into the swirling clouds below.

*He must have turned belly-to the shock wave,* Ensign thought, shifting under the added weight of the new remoras. Accident? Or had he tried to shield Simon with his own body? They would never know.

In silence, they climbed to a safe altitude. Ensign wanted to start the song of mourning but the shock remained too fresh and too deep. The labor of carrying twice the normal compliment of remoras drained him to the inner core of his being. He longed for a quiet updraft filled with plankton.

"Killer was right," Melody finally said forlornly. "There is no more Bach Choir."

"We have the remoras with the songs," Ensign protested weakly.

"More songs than we can ever learn," she said sadly. "More remoras than we can keep or care for. Don't you see?" her voices soared into the high registers in fury, "We've lost! We would have done better to keep the Choir together. If we'd died in skyfall we would have gone all at once. As it is we've died a little at a time and a little at a time, until now there's nothing left!"

She turned away and fell silent, leaving Ensign grasping for something to say.

"Listen." The Geek sang out.

With his damaged hearing Ensign had to deliberately shift through the registers to find it. There, down in the lower frequencies he found it.

*Come, come, come*

And then above it the higher frequencies.

*Come ye weary travelers.*

"Others made it!" Melody sang out.

"Maybe," Ensign said. "Or maybe they were here all the time. We can join them."

"High Folk to share our songs," Melody trilled even higher in her excitement. For an instant she sounded like Crystal.

"And new songs!" The Geek chirped. "Songs we compose!" He hummed a phrase, tasting it.

*"Ten traveled Northward when new stars shone in the sky. . . .*

Yes, thought Ensign. New songs. Songs about their travels and who they had been. Of Teacher and Simon, of Shorty and brave bright Yearling. Of Droner and Crystal. Their songs, their hopes, their dreams, and all that had made up the Bach Choir.

That was the answer, he realized. The reason for everything they had gone through. The Bach Choir would live in those new songs. And they would be alive as long as the High Folk sang them. Meanwhile the tool songs would help others and perhaps the next time the sky fell, Simon's songs of prediction would allow others to survive.

Melody had caught the mood too, humming tentative little rills based on The Geek's musical doodling.

"*We come. We come,*" Ensign rasped out.

With a lift and swell of hydrogen, Ensign winged over and took the pod leader's place. Still singing the response, The Geek and Melody fell in behind.

In loose formation the last of the Bach Choir and the first of a new choir, yet unnamed, turned east and glided across the cloud tops of Jupiter toward the rising Sun. ■

> Random systems exclude self-organizing properties and cannot exhibit significant nonlinearities. Yet these are precisely the attributes of intelligence. Cognitive behaviors defy Poisson distributions. Assuming that intelligent species have no statistically significant role in their own evolution is not justified by either biology or mathematics.
>
> Gregory Benford

Buzz Aldrin
with Aleta Jackson

# RETURN TO THE MOON

*"It's been 24 years since I walked on the Moon. I want someone to go back." — Buzz Aldrin, 13 Oct 93*

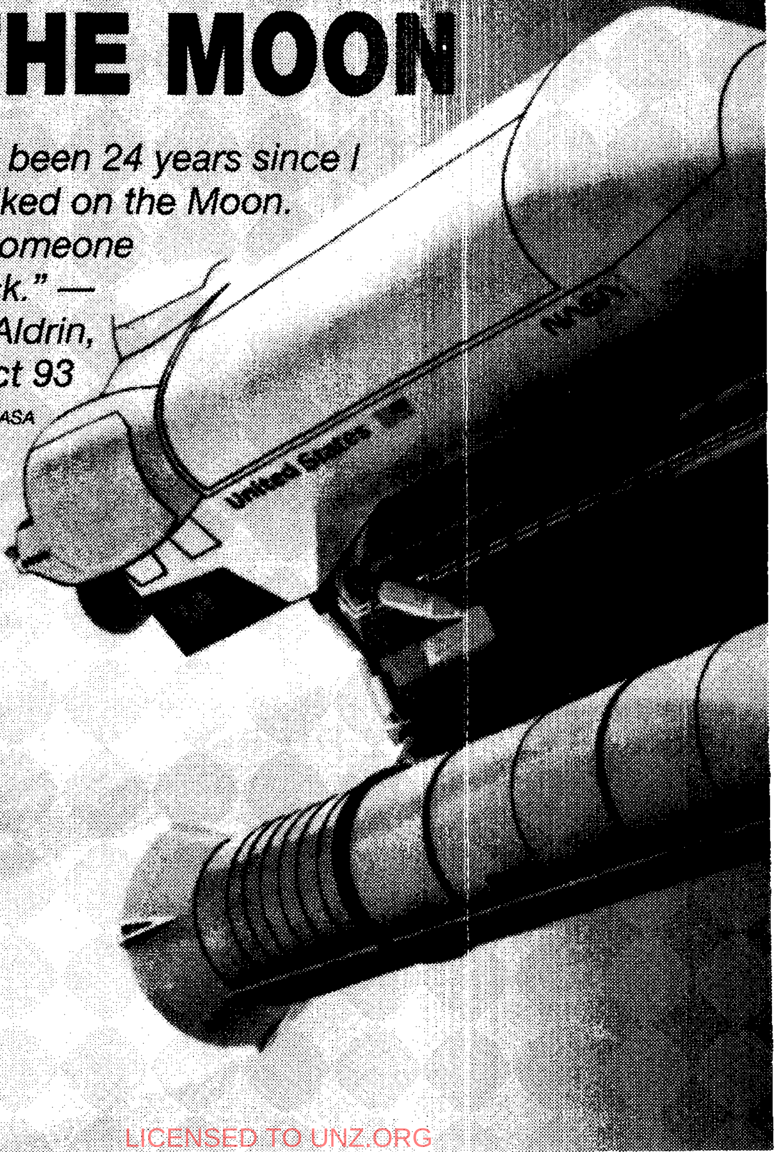
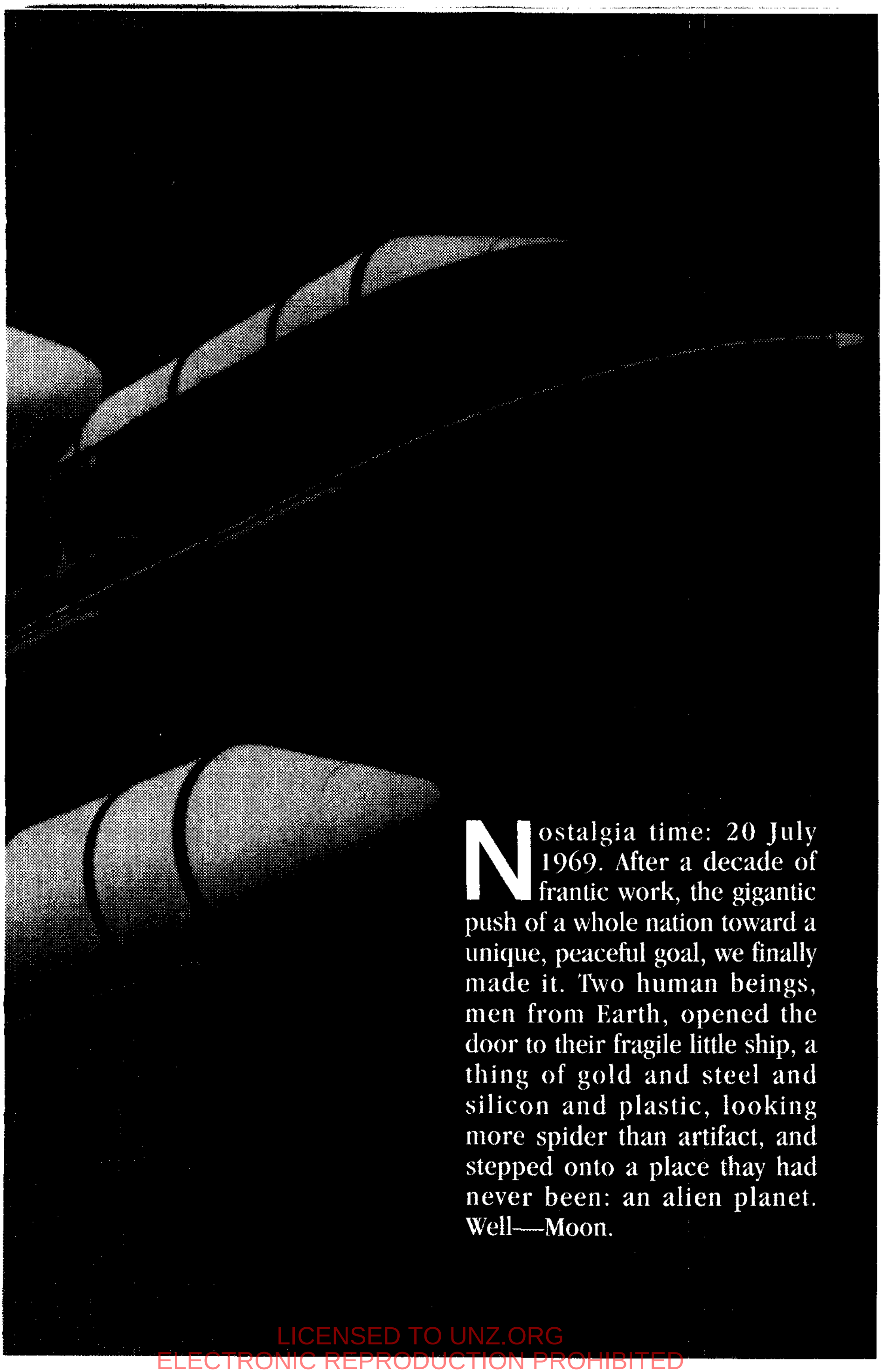
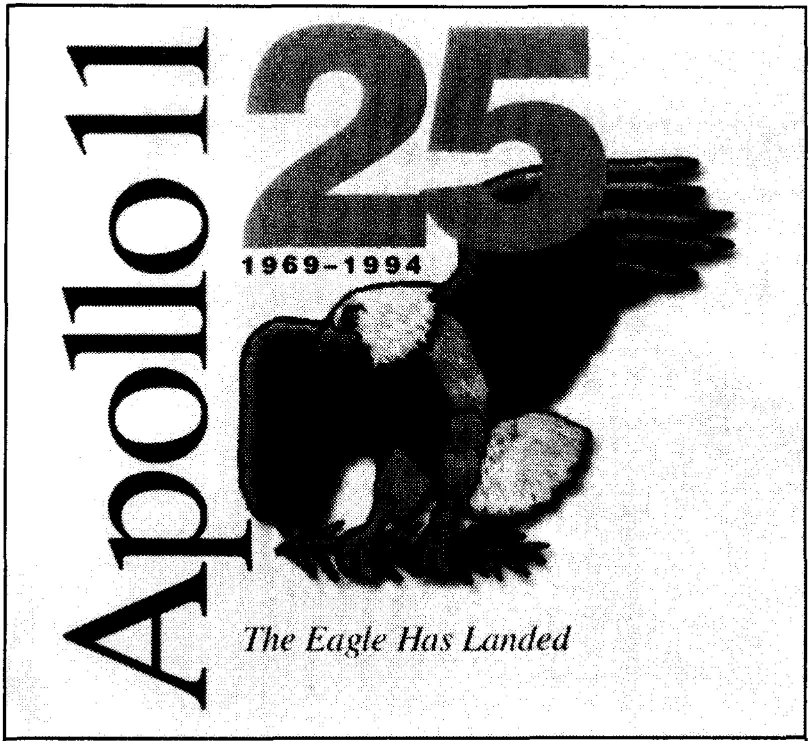

United States
NASA

*Illustration credit: NASA*



Nostalgia time: 20 July 1969. After a decade of frantic work, the gigantic push of a whole nation toward a unique, peaceful goal, we finally made it. Two human beings, men from Earth, opened the door to their fragile little ship, a thing of gold and steel and silicon and plastic, looking more spider than artifact, and stepped onto a place thay had never been: an alien planet. Well—Moon.



This official NASA commemorative logo marks the 25th anniversary of the first lunar landing (July 20, 1969). The design incorporates an eagle, from the original Apollo 11 crew insignia, descending toward the lunar surface with an olive branch, symbolizing America's peaceful mission in space.

Never forget this: we went from a standing start to walking on the Moon in less than ten years. Nothing seemed to stop us; we could do anything. Not only did President Kennedy's words fire our imaginations: "We choose to go to the Moon and do the other things not because they are easy, but because they are hard!" Not only did we need to recover national pride from the various bruisings the Soviet Union kept giving to us. Those early rocket days admitted to dreamers, dreaming greatly, and engineers and designers who saw a wider horizon. Even the federal government got starry-eyed! One of the best expressions of our vision, of course, was the movie *2001: A Space Odyssey,* which was released before we ever landed at Tranquillity Base.

Well, those days are gone and it's foolish to try either to repeat or repent the past. The tooling for the great Saturn V rockets has been modified to produce the Space Shuttle's External Tank (ET) and other rockets. Our goals have changed, and so have we. Should we go back to that lonely dusty worldlet 238,856 statute miles away? There's no air to breathe up there, no people we can talk to, no beaches to walk upon. Why go back? And if we do go back, how?

We must return to the Moon for any number of good reasons.

●Astronomical observations on the Moon's far side. Electromagnetic chatter from Earth is already interfering with some observations; we need the quiet shadow cast by the Moon's bulk between Earth and the stars.

●Possible fusion fuel. It has been demonstrated that deep sea vents and other terrestrial sources might supply enough $^3$He for commercial fusion; if it is as abundant on the Moon as our early explorations have suggested, $^3$He will be cheaper to mine there than here.

●Unique materials processing opportunities.

●Lunar surface solar power stations.

●Tourism.

●Mars: the Moon is the stepping stone to Martian exploration and colonization.

●Wholly unexpected discoveries. For instance, in "Tides of Tiber," (due out in fall of '95), Buzz Aldrin and John Barnes posit that human flight to the Moon is stimulated by the discovery of alien artifacts found in a crater on the Moon's far side.

The people in "Tides" reach the Moon by using Russia's gigantic Energia booster and a Soyuz space station. Judging by the headlines (this is written in early December 1993), this is both fairly good and fairly bad speculation. Though NASA has just signed agreements with Russia to use their launch capabilities in conjunction with the American space station program, the Energia assembly line has been shut down because of cash-flow troubles.

There is the second question to answer: we should go back, but how? To reach the Moon and to go to Mars, we must have routine, affordable access to space. To make Lunar colonization and exploration pay handsome dividends, both in terms of scientific discovery and increased prosperity, a trip to the Moon should be no more expensive or troublesome than a ticket on the Concorde. The solution comes in two mutually supporting parts.

**First part: reliable lift to low-Earth orbit (LEO).**

Currently the United States is suffering turmoil and uncertainty in its launch sector. Competing interests argue and squabble over a rapidly diminishing budget while the Congress is more concerned with short-term special interests and troubles on the ground than the nation's future in space. The Space Shuttle (also called STS for Space Transportation System) is aging and expensive. Replacement or follow-on systems such as reusable spacecraft and expendable launch vehicles (ELVs), variously named Spacelifter, NLS, SSTO, NASP and others, all have their proponents and detractors, engaged, at times, in such shrill debate that it is difficult to see how any Western effort would succeed on its own.

The prerequisite to safe human access to space is heavy lift boosters, and right now the Russian Energia booster offers the most promising lift capacity for Lunar missions, but because of the current instability in the former Soviet Union, we can't assume that the Russian booster will be readily available to us. We must plan beyond Energia. The United States should pursue a progressive, "phased modular" strategy on its own, though in the future we may ally with other space development partners, including China.

This strategy should begin with a basic core cargo/manned module—a modified space shuttle body, which has its own engines. This body is mated to a reusable, "fly-back" booster—a modified external tank (ET)—that has strap-on, liquid-fuel, high-lift-capacity motors attached (this echoes the original space shuttle design concept, and is used by the Energia system). These two modules together create a fully reusable two-stage booster for human or cargo STS replacement.

The strap-on booster module also means that an unmanned, engineless space shuttle body can be attached for cargo delivery to and from LEO.

With this lift capacity, a new Lunar Mission can be developed. This mission encompasses arrival of people and material in LEO, orbital initialization, translunar insertion (TLI), and a direct Apollo-type landing on the Moon. This system also allows old worn-out boosters to be landed on the Moon and made into useful volume for habitation, laboratories, or whatever else is needful. Most of the strategies that should be entertained should plan for the maximum amount of recoverability of tanks, strap-on boosters, hardware, the works. Until large colonies and settlements are firmly established on the Moon and elsewhere, we'll have to be good at scavenging and recycling everything.

This double-module system can grow nicely into providing other services. A large modified ET/strap-on vehicle can be parked at L1, where people can rendezvous with it to either take on or deposit fuel (LOX, $H_2$, $^3$He, etc.). This activity supports thriving Lunar operations while allowing for growth toward Martian exploration and colonization. A Mars expedition will pick up its propellant from L1 while its cargo will be lifted from Earth.

The Moon and Mars can support each other much easier than trying to support Mars from Earth. As Robert Heinlein once observed, it's easier to get to the rest of the Solar System from low-Earth orbit than from the bottom of Earth's gravity well. Without a solid, thriving Lunar infrastructure, the settlement of Mars won't be sustainable.

**Second part: Drastically reduced cost to orbit, and tourism, must precede any Lunar mission.**

A Lunar outpost and colony will be expensive. And it is folly to think in this time of tight budgets and increased public skepticism about space missions that the American public will support another Apollo-style stunt. The American people must be fully engaged in space exploration. With fully reusable rocket ships, no matter if they are single-stage-to-orbit or reusable two-stage modules, space tourism will help to bolster public support of this project because this time we'll be going back to stay. And soon after that people can start to call the Moon "home."

It's been 25 years since those first footprints compacted Lunar soil. The Apollo and other "pre-Shuttle" astronauts want to return to the vision they had when they trained for their missions. They thought of the space program as linear, a continuing, forward-moving series of steps from the Earth to LEO to the Moon to Mars and beyond. Even when the Apollo program was halted, they thought that a return to the Moon could be accomplished without a great deal of heartburn. They thought that we wouldn't stop.

Now, we have to start over. And we must do it right this time. If we can put a man on the Moon, and a space station in LEO (Skylab), then we should build and launch a space station to LEO and put a man on the Moon. Note the phrasing: we need to put the pieces of the puzzle together in the proper order, this time.

"If we follow this plan of building modular, re-usable boosters, of planning for sustained, regular steps into space, of deciding to go back to stay, of planning for tourism and factories and regular airline-style operations to and from space, I think we have a chance to make it stick. It's been 25 years since I walked on the Moon. I want someone to go back. If we follow this plan, I can almost get excited about it again." —Buzz Aldrin ■

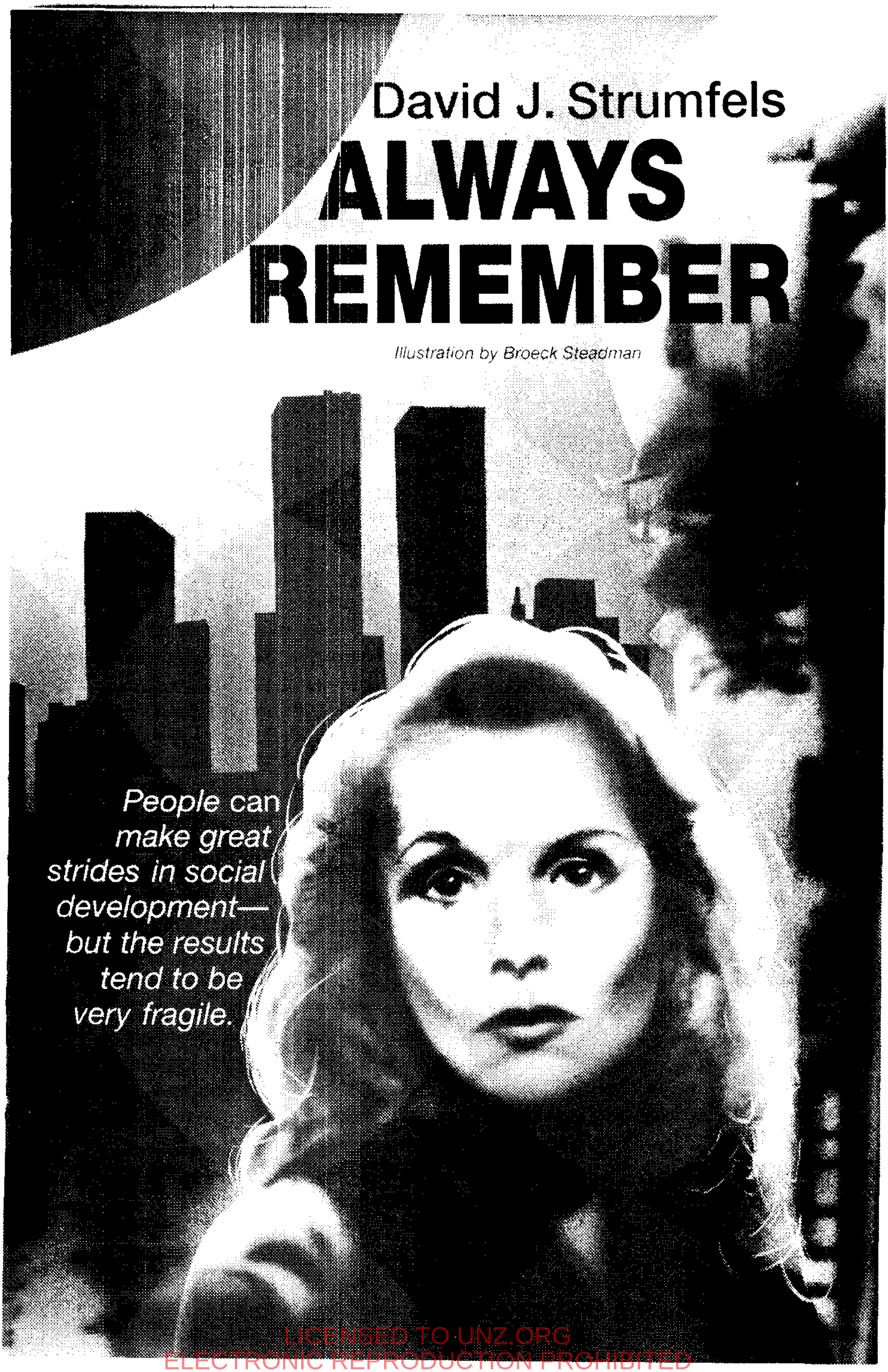
I've never believed the reason to go to space is to make a buck.

J.R. Thompson, former Director
Marshall Space Flight Center, VP
Orbital Science Corporation
(Submitted by Marianne Dyson)

### David J. Strumfels

# ALWAYS REMEMBER

Illustration by Broeck Steadman



*People can make great strides in social development—but the results tend to be very fragile.*

*Dear Ms. Jiang:*

*It is with regret that we must inform you that your services as Coordinator for Developmental Methods are no longer required. The termination of your employment is effective immediately. As per terms of your contractual agreement, we are transmitting a lump sum payment of 50 percent of the value of the time remaining on said agreement.*

*We would like, at this time, to express our gratitude and appreciation for your many years of service. . . .*

Lisa flicked the letter into the trash icon. Oh, how polite they could be as they finally tripped the lever and the blade fell! You wouldn't have known it was the same men and women who had presided over her hearing. Oh no, there things had been quite different. Fredrickson had practically drooled at the taste of her blood. Even the others had chimed in with the rancor this time—no doubt, having seen a bit too much of themselves to feel comfortable. Idiots!

*Excuse me, who's the idiot?*

She shook her head at the answer to that question even as she called up the schedule of Earth-bound shuttles. She chose the earliest one that still gave her time to pack and pay off her lease. And say good-bye to what few friends she had left here. At least it was over.

"Good morning folks, Reed Ready here, the Voice of Reason, the Nemesis of All Things Nutty and Nonsensical. Take a deep breath, you're about to hear some good old fashioned common sense. Ready? Good, 'cause here we go. . . .

"OK, let's *talk* about it. The bugs are walkin', the groundhogs are squawkin', and the diplomats are talkin'. And the loonies and the grangers? Well, they're hawkin', even if we don't know what yet. We will, soon as our jock straps are on tight enough, you can believe that.

"Of course, we won't even mention the trillions we groundhogs spent to build all those colonies and stations. Or the blood, sweat, and tears. And God forbid we even breathe the fact that, if it weren't for us, there'd be no bugs to strike. The World Court might whack our knuckles for thinking we had a *right* to a return on our investment. You got none, brothers and sisters, you better remember that. None at all. Take your maintenance and be happy.

"Speaking of the brothers and sisters, it's time I turned things over to the real voice of reason. The net is officially open for your input, as of *now*. Woa, come down. One at a time, folks. The word'll get through. . . ."

The images and natter faded into background as Lisa stepped onto the platform and looked about. She sighed. New York hadn't changed. It was still noisy, smelly, gaudy, rude, and, more than anything else, crowded. You couldn't even walk the boulevards without continuously having to avoid bumping into people. As for getting around—the attitude of the natives seemed to be, if you didn't already know the tubes, you had no right to be there anyway.

Fortunately, this time the stop was

only several blocks from her destination. She emerged into bright sunshine, between Washington Square and the area her grandmother had always called Greenwich Village but had been Ecology Park as long as Lisa could remember: enormous domes covering the vast zoological and botanical gardens. The domes gleamed gold and silver in the morning Sun, like huge mosques.

History sluiced from Lisa's mind as she walked. It was hard to imagine that there had once been ten times as many people in this city as there were now. Not to mention fossil fuels, crumbling sewers, bankrupt government and a staggering crime rate. Now *that* must have been hell. Hell on Earth. No wonder they had so many wars and other types of violence; it was a major miracle they ever had any peace at all, in any place, for any length of time.

"How we ever got this far. . . ."

"I beg your pardon, Ms. Jiang?"

Lisa popped back to reality. The soft, simian brown eyes of the shimp receptionist were upon her, that mixture of curiosity and trepidation that shimps seemed perpetually to hold for their officially equal cospecies. It made her think instantly of Allison, though this particular shimp was male.

She sat up, brushed off the slacks of her best dress suit and put on her best smile. "Nothing. Er—" much as she hated being pushy, she couldn't resist the opening—"do you think Ms. L'uboleng will be free soon?"

The shimp—Ben, according to the name plate on his desk—batted his long eyelashes painfully. *It's not easy to say no to one of your betters, is it?* Lisa reflected sourly. The automatic assumption angered her, and then angered her more by her realization that castigating him for it would only reinforce it.

"As a matter of fact, I'll see you now, Ms. Jiang."

She twisted, toward a short but authoritative looking woman, with clipped strawberry hair, standing in the shadows at the end of a hallway. The woman emerged into full room light, glanced at Ben—who smiled back timidly—then looked at Lisa with narrow, inlaid eyes. *She thinks I was trying to intimidate Ben,* Lisa concluded. Great. The worse thing was, any attempt to deny, apologize or explain would only implicate her.

It was always encouraging to start an interview on the right note!

But if there were any rancor on L'uboleng's part, professionalism overpowered it quickly enough. The two were quickly on opposite sides of an impressively equipped desk, and questions were arriving briskly. "I saw from your resumé that you've spent the last few years on Lagrange," L'uboleng opened. "In fact, that you got a position there right out of college. That's not an easy thing to do; most of us have to begin our career Earth-side, and work our way up. If we can."

There was no resentment in L'uboleng's voice as she recited the standard groundhog attitude; it was a flat statement, delivered flatly. Which did not make it any less remarkable. Lisa herself had been shocked when the position on Lagrange was offered her. Only later had she discovered her reputation for creativity and ingenuity, a reputation she had never learned to feel worthy of however many successes she enjoyed.

Now was not the time to savor that irony. "Yes, I was surprised by the opportunity," she said, "especially as there were so many others more qualified than myself."

"But you left the colony," L'uboleng cut in. "Not only did you leave, you left a fairly imposing research position—not," she smiled, "that a classroom full of children isn't challenge enough for anybody. But frankly, Ms. Jiang, it's not exactly what I would call a career move."

Lisa felt herself growing suddenly hot and sticky in all the wrong places. "I suppose that depends on what you mean by career." It was her prepared line. "Personally, although I found research exciting, I missed the challenge of dealing with young minds directly. Unfortunately, by the time I discovered this, my old position had already been filled and there were no new teaching spots available. By then I was also coming to realize how much I missed home—I'm a native, you know—" *You're laying it on too thick.*

L'uboleng frowned skeptically. "Really? Very interesting. You were born here?"

"I grew up in what used to be Chinatown. Five generations, if you go back to a great grandfather who came from Hong Kong after the Revolution—" The glaze in L'uboleng's eyes dashed Lisa's hopes that they would both be history buffs. "Of course, things have changed since I left. But all the things I love are still here. It's still—New York."

Ms. L'uboleng licked her teeth. "Mmm." She glanced down at her desk. "Well I certainly can't argue with your credentials. I—what can I say? From what I've seen you'll be a terrific addition to our staff." She put out a well-manicured hand, "The board will have to officially approve you, but that should only be a formality. Welcome aboard, Ms. Jiang."

Lisa was dumbfounded at the sudden turn of events. But she took the hand without hesitation, happy to have some meaning in life again, even if it was under less than ideal circumstances. So, she had a job! After all she had been through, that had been far from a guaranteed thing.

She *was* happy. That became obvious enough the moment she emerged into the receptionist's area again, and Ben turned his watchful eyes on her. "So, did you get the job?" he stopped her in mid-strut.

Lisa was so ecstatic, in fact, that the shimp's forwardness did not make the immediate impression on her it ordinarily would have. "I start next week," she chirped. "Of course, we still have to get all the legal stuff out of the way, but that won't . . ." the incongruity of Ben's behavior struck her then. His eyes were directly on her, in an almost flirtatious manner. Lisa had never, *never,* known a shimp to be so—so provocative, if that was the word for it. If he had been human, she would have actually thought he was making a pass at her.

Which was just too intriguing to walk away from without investigation. Specism might officially be dead and buried, but in the New York she grew up in, like just about everywhere else, shimps knew their places. A shimp who didn't was a round peg in a square hole.

"Thank you for asking, Ben."

"Ms. Jiang."

"Please, if we're going to be working together I insist you call me Lisa."

Ben should have writhed in discomfort, if not outright horror, at such familiarity from a hom. Instead, it was his response that had her disoriented. A heavy, jet-black hand reached across the desk; a hand that was strong enough to crush her own to a pulp, or, for the matter, the life from her body if it got around her throat.

"Pleased to meet you, Lisa."

When she accepted the hand she realized that she had never actually touched, even by accident, an adult shimp. The flesh, she noticed, and noticed she noticed, was warm and moist.

She felt foolish.

Ben grinned, as though he knew exactly what she had just gone through. "I had a feeling Julia would offer you the job. Most of the applicants that come in here, you can tell right away they're unsuitable."

At that moment, Ms. L'uboleng's voice broke in over Lisa's thoughts. "I'll be out to lunch for the next hour," it announced.

"Excuse me, that's my cue," Ben said, with a raised hand. He issued a terse macro to his desk. "It means I'm out to lunch too," he explained, "for the next fifty minutes." He stepped from around the barrier. "Care to join me? There's this new loonie place I've been dying to try."

Again, Lisa fought her disorientation. This was quite unbelievable. "Sounds wonderful. I haven't had Lunarian in—ah—actually, I've never had it."

"You're joking. Really?"

"Really."

The "loonie place" was a ten minute tube ride away. When they got there Ben ordered for both of them, partly because her knowledge of "green cheese" was as promised, but mostly because she couldn't make herself think about food, any kind of food, at the moment anyway. And in fact, she hardly noticed what she was eating, except that it was largely green and cheese-like in texture, infused with artificial flavors, and was artfully arranged more than it was delicious. As though it really were made from algae and recycled wastes.

"All right," she finally said it, "tell me why I wasn't unsuitable."

Ben looked at her as though she'd said something truly stupid. The look lasted only a moment before he broke into soft laughter. "Julia must have been even more impressed with you than I was. You mean she didn't ask you how you felt about teaching shimps?"

Lisa almost jumped from her seat at the revelation. "As a matter of fact, the issue never came up. If it had, I would have told her... frankly, I would have told her it was an insulting question. I've taught many *shimp children in my career.*" She wanted to ask if that meant she would be teaching a classroom full of shimps, but didn't dare.

Ben narrowed his eyes. "You mean, up on the grange?"

"There are a number of shimp families on the colonies," she insisted. The statement made a bitter echo in her mind: *damn it, I'm not defending what happened up there!* "Not as many as there should be, of course."

Ben leaned back, and let his shoulders slump. "You know, you don't have to try so hard, Lisa. Your body language screamed your feelings the moment you walked through the door and found yourself in a position to boss a shimp around. Most homs just take it for granted, even when they say with all the sincerity of their hearts that they're against specism. That's what I mean about being obviously unsuitable."

Lisa took a few moments to absorb the words. "So, that's your real job back there? Weeding out the bigots?"

Ben nodded. "There are some advantages to being a Pan Sapiens." He shook his head. "By the way, I despise that term. There's nothing wrong with shimp. These periodic language upgrades are just plain silly; can't people see that no matter what term you use, the bigots will eventually give it an ugly connotation just by using it?

"OK," he said, before she could probe the statement, "now that I've answered your question, you have to answer mine. What *are* you doing here, anyway? Nobody goes from a high profile job on a colony to wiping noses Earth-side. And don't tell me it was for the challenge of teaching young minds, or that you just needed the change."

Lisa reflexively stopped eating, and dropped her forksticks onto her dish. "You know," she said, "I'm starting to think that you're the one bullying me around."

Ben chuckled through a broad, big-toothed grin. "I am one hell of an uppity shimp, aren't I?" The grin vanished, and he stared at her. "The way I figure it, you must have made a lot of people up there awfully mad." Then he shrugged. "But I'll drop the subject if you want. It's completely up to you."

It probably didn't take as long to make the decision as it felt, sitting there and letting all the thoughts and emotions boil through her again. "Yes, well, holding up a mirror to people is not exactly a good way to make friends and influence people." Well, why the hell not? What was the point of doing the right thing if you couldn't spend the rest of your life being punished for it?

She realized Ben was handing her a napkin. "I don't recommend crying in public," he said, "but if you must, at least do it tastefully."

Lisa declined the offering and pulled herself up straight. She had been close to tears, she realized. Angry tears. "I'm sorry. It's just that I was thinking of a certain child. A student of mine. . . ."

"A shimp?"

She sat up with a start. How did he— "I remember some net talk about a shimp child up on the grange getting beat up, about a year ago," Ben explained. "There weren't too many details though; everyone seemed to agree that it was just your run-of-the-mill kid fights."

Lisa fought down her fury at the distortion. "Four against one is hardly one of your run-of-the-mill fights," she revealed one of the details that conveniently hadn't found its way into the net.

"Four against one? Oh well, that is about what it would take," Ben said, with a small smile. "That's the advantage of being the only shimp in school. On the other hand, you also learn very quickly not to abuse it; the shums won't put up with a shimp who doesn't know his place, and they're *very* good at organizing. So: what did the kid do?"

Lisa started. Shum was a word educated pans, er, shimps, used: if they were supersmart chimps, then the dumb homs were sub humans. This was the first time a shimp had ever used it in her presence, however.

"Allison. The child's name was Allison."

"What did Allison do?"

Lisa closed her eyes for a moment. "She came in second place in the school's annual math contest."

"Oh, the worst kind." Ben shook his head. "The ones who are smart, but not smart enough to play dumb. Don't they know how tough they make it on the rest of us?"

He looked up at her, his eyes humorous with self-deprecation. "But that still doesn't explain what happened to you," he said. "I take it you came to her defense."

"Worse than that. I made them see why it happened—what they really thought and felt, and how it affected the children."

"Hmmm, oh dear, not a very good idea. And how did we pull that off?"

Despite herself, Lisa couldn't fight off the laughter that bubbled up at Ben's sarcasm. Undoubtedly, it was how he had long ago learned to live with the realities of his own life. She told him the whole story: how she had used the cyberlink to raise her students' consciousness about historic bigotries, such as the Nazi concentration camps; about the initial outrage her methods provoked; about her confrontation with the board, and how she won them over by telling them about the girl and how the other students treated her, about being given the newly created position of Coordinator for Developmental Methods.

Ben nodded as she spoke, his eyes steadily widening, whether in admiration or incredulity she didn't know. "That was a couple of months before the strike," she finished her story without concluding either way.

"Ah. The Big Bug Strike."

It hardly seemed necessary to continue. It was a widely known fact that the great majority of asteroid miners were shimps; it was also a fact, albeit not as widely known, that most of those shimps had built the Lagrange and lunar colonies, only to find themselves for various reasons ineligible for citizenship on those same colonies afterwards. "Before what happened to Allison," she nodded. "After the—incident—I tried to set up a new program, using the cyberlink to explore contemporary forms of prejudice. Of course I knew it would only mean more controversy, but I thought—I felt I owed it to her. . . .”

This time she accepted the napkin, and blew her nose noisily.

“There, there,” Ben comforted her, “wipe your nose and dry your eyes, and Uncle Ben will tell you where you screwed up.” Then he wrinkled his chimpish nose: “You know, you have a way of taking all the fun out of human stupidity.”

Again, she couldn’t stop the laughter he seemed to find in her so effortlessly. “I’m sorry.”

“Your mistake was that you forgot why they gave you that fancy title. ‘Coordinator for Developmental Methods.’ It was to convince themselves that they weren’t what you were exposing them as. And by accepting it, you gave them the assurance they wanted. After that, you have to understand, in their eyes what you did was treason.”

“But—”

He raised a hairy hand. “No, listen to me, my dear Ms. Jiang. They know they’re not bigots. Racism, sexism, religious persecution: that’s all history as far as they’re concerned. Humans fought long and hard to overcome those things, feel proud of their triumphs, and don’t want to be told that the enemy is still alive and kicking.”

Lisa put her own hands on top of his, and forced them down on the table. “But that’s exactly what I was trying to show them!”

“And you thought you would succeed. Funny: I thought you were a smart hom.”

At that moment, a bot came up to them and asked if they were finished with their meals, and, if so, were interested in seeing the dessert list. When Lisa made no response, Ben squirmed from her grip and flashed his credit strip to the bot. The bot intoned, “Thank you sir,” and vanished back where it had come from.

“Hey—”

“The one mistake you must never make, is to assume that human nature has changed in some fundamental way,” Ben insisted. “That’s the mistake Arthur made at Camelot. External circumstances change, yes; internal—when that happens, you won’t be dealing with people anymore.” He thumbed in the direction the bot had disappeared. “Maybe you’ll be dealing with that. But not human beings. Or even shimps.” He chuckled.

Lisa thought for a while, then shook her head stubbornly. “No. The problem isn’t human nature. The problem is, is, well for one, it’s people like this Reed Ready jerk of yours.” She snorted her disgust. “What sewer did he crawl out of anyway?”

Ben made a face. “Of mine? Hey, don’t assign ownership of that chiphead to me. And don’t ask me where he came from. I can only tell you when: nobody I know ever heard of Reed Ready and the Voice of Reason until the Strike, although he must have been living in some little hole in the net somewhere. Now—you can’t go on-line anywhere without finding him there, waiting for you.

“What does that prove?” he cut off Lisa’s that’s-what-I’m-talking-about.

"It's a free society; the Readys don't prosper unless people want what they're selling. People filled with love don't buy hate."

"But if hate is being shoved down their throats, day and night—"

"Try telling them that."

She took a breath. "Maybe nobody has—"

"Be my guest. Ready lets anyone talk who wants to. Not too many people try. At least not twice. He's very good with facts, if you know what I mean. And the worse thing is, he's principled too; he really believes what he believes, if you know what I mean about that too."

Lisa knew. "At least we didn't have that up on the colony." Even Frederickson wouldn't have spewed his venom all over the net.

"No, you just beat up little kids."

The riposte cut right through her.

"I'm sorry. You don't deserve that."

Lisa smiled grimly. "Don't I? I was Allison's favorite teacher, you know."

Ben sat up straight. "No, I didn't know." He leaned his head back. "Let me guess: you're the reason why she entered that contest in the first place. Which, of course, makes what happened to her all your fault."

"Aren't you going to tell me that it isn't my fault, that I shouldn't blame myself, and all that? That's what you're supposed to do."

It was exactly what she expected him to do, but instead, Ben checked his watch. "There's nothing I'd like better than to take a crack at that no doubt invincible wall. But I'm afraid my fifty minutes were up ten minutes ago." He stood. "If there's anything I can do—"

"No. There's nothing. There's nothing anyone can do. I have to live with it, that's all."

Ben frowned, and nodded. "In that case, Ms. Jiang, I suggest you start thinking about how to do so. It strikes me as a job you don't want to put off too long." He left her sitting by herself, with her thoughts and her unfinished lunch.

She was still shaking when she got back to her compartment, where she collapsed onto the divan. "News update. The Strike."

The housepad defuzzed into life, and images from across a billion kilometers flooded into her compartment, along with the newscaster's easy monologue. She grimaced at the impact. The UN was still denying the legitimacy of the strikers' demands, and insisting on full compliance with the '84 contract. The Lagrange and lunar colonies agreed with this position, which didn't quiet the loudmouths on Earth who claimed the colonies had instigated the strike in order to control the terrestrial markets the Belt had generated. Lisa sighed again: she'd heard the same allegations, victims and villains reversed, on the colony. Everyone took it for granted that he was the one getting the shitty end of the stick; and that the miners, who were in fact truly holding that end, were greedy, selfish usurpers of a public trust who were abusing the power of their position and needed to be shown that they couldn't get away with having their grubby hands in the cookie jar all the time.... *You got that right, brother!*

She shook her head at the spectacle. The only positive thing that could be said is that things couldn't possibly get any worse. The only way they could get worse was if war broke out.

Which was, of course, unthinkable.

Then she thought of Allison again. War, after all, was that, on a much greater scale.

At least next week came quickly enough. Lisa donned her best *Qi Pao,* the one her grandmother had given her, and combed her black hair out long and straight in the old way, the way she'd learned long ago made a very good first impression on children. She used just enough makeup to look pretty, and to mask the sleepless night she'd endured the night before. Then she took a deep breath, and let it out slowly: *here we go again.*

Once upon a time, a long time ago, the Powers That Be decided that bots could be used for teaching, thereby freeing human beings for higher and nobler purposes. Not any old bots, of course, but specially equipped and programmed bots, bots designed by the elite of the educational establishment, bots which would contain in their neural networks every rational teaching technique and skill ever discovered. Bots that were the result of years of meetings, conferences, symposiums, discussions, debates, editorials—even before the first one emerged from its assembly tank they had become the most complex, and expensive, bots in history. Or most expensive nonbots, as someone put it. However described, they were a glorious failure. Within a few years of their introduction, they were gone: returned, junked, cold-stored, deliberately or "accidentally" damaged beyond repair.

Why? Nobody had ever really answered that question, though that same establishment produced CDs full of theses in the attempt. Indeed, with the development of the cyberlink, it wasn't clear why teachers mattered at all anymore, human or otherwise. The kids should have been able to plug into the net, and had their educations personally spoon fed to them by a sufficiently intelligent Arty. But such an Arty had preceded the bot experiment, and it had failed too. Again, no one knew why.

"Children! Children! Pay attention, please—Erin, stop making faces at Minh right this moment, and look this way. Very good. You too, Iwao. I want you all to say good morning to your new teacher, Ms. Jiang."

Lisa smiled as prettily as she could. "Good morning, class."

A dozen decidedly human faces. And silence.

*But I thought....*

A dozen pairs of eyes studied her with that mixture of hope, awe, fear, wonderment, curiosity, amazement, feigned indifference and three or four other emotions that only children could brew in one kettle. Lisa walked over and sat down behind her desk, and perused the surface casually. It was an ordinary desk: there was a pad, a keyboard, mouse, light pen, and a cyberband, which would need some adjustments. For a moment she was back on the colony, about to address all those eager faces she suddenly could see so clearly again. She swallowed what the vision brought up. "Begin recording," she told the pad. A whispered titter rose in the back of the classroom. She silenced it with icy eyes. Then she folded her hands on the desktop, and leveled a warmer version of the same gaze at all. "Well, now you know my name. It's going to take a little longer for me to learn all of yours, I'm afraid. You can help me by putting your hands on top of your pads. Erin, that includes you."

The day went about as well as could be expected. Lisa put the children through a medley of more-or-less standardized tests (to a twelve part harmony of whines and groans), and reached preliminary assessments about their relative skill levels; assessments that matched up well with those she had been given, but she'd learned to rely on her own judgments. None of this told her anything about the individual personalities she was dealing with, of course. That would take time, and, unfortunately, a certain amount of trial and error. But she felt, by the day's end, that all was going to go well. At least, they all smiled at her as they filed out of the classroom. Even Erin.

*The Trial: Day One.*

She was just starting to enjoy that relaxed feeling one gets when an ordeal is finally over, when she realized she wasn't alone. Her first thought was to wonder if Julia L'uboleng had a habit of lurking in hallways and scrutinizing people unawares.

The shadow emerged into room light. "They certainly seem enthusiastic," it said.

"Yes, they do."

"Of course, children are always that way. Easily excited."

Lisa had an unpleasant sensation about where this conversation was headed. But she saw no way of avoiding it. "That's why teaching is all I've ever wanted to do, ever since I was a little girl. I can't imagine any occupation as challenging as—"

"They're living, feeling beings, you know."

Lisa wasn't sure what jerked her harder: the statement itself, or the manner in which it was delivered. Again, there was nothing hard or hostile in L'uboleng's voice or expression; it was as though she were describing the weather, or a hat she'd seen in a store. Which only made the words' impact that much harder.

"You have no right to use them as laboratory animals," she continued. "No matter what your motives are."

Lisa fought to gain control of herself, but she could not stop from reeling under the assault. "What are you talking about?"

"You know what I'm talking about. The shimp girl. What you did to her."

It was several moments before Lisa could compose herself to say anything. "If you know all the facts of the case you know I did everything I could to protect her," she tried. But the words sounded weak, insincere and tired, as they always had when she recited them to herself.

"Sure. After you set her up as a bull's-eye for every bigot on the colony."

Lisa bit on her words, and her lip. It was the ugly, inedible truth, the type that sits in your guts like an iron ball. The type that sends up biles of guilt every time you forget to make yourself not think about it. She had used Allison—had used all of the children, for that matter—in order to reach the adults. She had done it believing, or at least hoping, that the end would justify such means, that her guilt would be worth the burden. A hope that had been crushed.

"There's just one thing I want you to know." The words were harsh now, hard and resolute. "You aren't going to do with Ben what you did to that girl. I won't let you. I hope you understand that."

*Ben? What does Ben have to do with—*

With that, L'uboleng checked her watch, turned, and made a brisk departure, as though she were leaving an empty room. As soon as she was alone again, Lisa was aware of her hands; they were wet with cold perspiration. Other parts of her body also weren't as dry as they'd been a few minutes ago. And she could feel her heart wailing away in her chest.

*What the hell was that about? What does Ben have to do with it?*

"Reed Ready here, ready to let reason reign. Are *you* ready? Well you'd better be, 'cause you're in the net, startinggg now—"

"—Bots and other machines to do the work, the cyberlink for entertainment, and when they get lonely. What more do they want? They should be grateful for what they've been given, if you ask me."

"If it weren't for the loonies and the grangers wanting all of space's resources for themselves—"

". . . Must have put them up to it. I mean, don't get me wrong, but let's be honest: your average shimp isn't exactly Einstein. Somebody. . . ."

The pad buzzed. "Yeah?"

"Your first day was that bad?" a sympathetic voice answered.

Ben. She shot up straight on the divan. He laughed: "I was going to ask you to join me for an evening in the park. Maybe some other time?"

She rubbed her face. "Central Park?"

He gave her a look like "Where else did you think I mean?" and shrugged. "I thought you might find the new Solaria exhibit interesting. Most newcomers do."

"I'm not a—" the Solaria exhibit had been built after she'd moved to the colony. *A lot of things are new around here.* "I'll meet you at the Columbus Circle gate in fifteen minutes."

She was there in ten minutes, still in her *Qi Pao*. He was waiting for her. A bot read his credit strip with a smile, again before she could protest, and he led her through the gate with a strong hand.

"Sooner or later I'm going to pay you back," she threatened.

"Paybacks are a bitch," he agreed. Then he pointed ahead of them. "In fact, here's your big chance. I came here betting that you haven't had any dinner either."

Her stomach churned, and she almost balked this time. "You can't be serious. Frankly, I've never been able to figure out how those things stay in business."

"Nostalgia. People like to imagine how wonderful the good old days were. Besides, this one makes the best dogs in the whole Park. Promise; you're speaking to a hot dog connoisseur."

The bot served up its wares with lickety-split efficiency. The steamy aroma of boiled meat swirled from its cart and filled her head; despite her misgivings, it did make her hungry. "So where's this S'laria 'xhibit," she said, in mid-munch.

Ben laughed. "Patience. One does not hurry through Central Park. Central Park is not a net order catalog. It's a shopping mall. A shopping mall of history. Of the past. Of the future." Ben spread out his arms. "Take this first level. A faithful reproduction of the Park the way it was in the late twentieth, early twenty-first century." He chuckled. "Minus, of course, the stuff nobody wants to remember, like the vagrants and garbage."

They sat on a bench in the playground, and watched a group of playing children while they finished their dogs. One of the children was a shimp, not that this appeared to make any difference. Lisa wondered how long that situation would last.

"Thanks for asking me out," she said.

Ben pulled back from a bite and stared at her. "Please be careful where, or at least how loudly, you use that expression. Unless you want to get me lynched—I'm sorry, did I say something wrong?" He looked perplexed for several moments before comprehension crossed his face. "I *am* a stupid shimp. I didn't mean . . . I swear, Allison was the last thing on my mind."

The statement took Lisa aback. How did Ben know about her confrontation with Julia L'uboleng this afternoon? No, of course he didn't know. He didn't have to. It was just a coincidence. "I wondered how long it would take to get back to that subject," she said.

"I thought you were going to handle it yourself," he answered.

She slumped. "What is there to handle? I'm guilty, that's all. Nothing you or anyone can say is going to change that. The only thing lacking is a court to pass sentence."

"If you wanted a sentence, why did you come back here?"

*Go on, say it. To seek asylum, that's why.* "Sounds like a pretty cheap guilt trip I suppose, doesn't it?"

"Most guilt trips are. Must be why so many people take them." Ben raised a hand as she opened her mouth: "I suppose now you'll tell me that, as a hom, you share the guilt of your whole species for what they've done to my people. If you do that, I swear I'll abandon you here and now, to the muggers and rapists."

"To the—" she coughed violently.

"Muggers and rapists. Central Park used to be famous for them. It's one of those unpleasantries they haven't tried to recreate. Sometimes I wonder why not: it might fix our eyes on the future better if the real past were thrown up to us once in a while. Most people today seem to think that their parents had it better than they do. A dose of reality might wise them up." Ben took the empty hot dog wrapper from her hand, and deposited both recyclables in the bin next to the bench. Then he twisted to face her more directly. "But back to your alleged guilt. I find the prosecution's guilt by association argument, however vile the species in question, specious and irrelevant. It's almost as bad as Original Sin, although I admit to a lack of experience in this area—that is, in feeling guilty about it.

"Does the prosecution have any other articles of evidence it wishes to introduce? Any further arguments? I didn't think so. Therefore, by the power invested in me by the state of plain old fashioned horse sense, I find the defendant not guilty of all charges." He reached out, and touched her lightly on the head. "Now, let's go see that Solaria exhibit."

They left the children, still playing peacefully if exuberantly. She wasn't sure exactly when or where her hand slipped into Ben's; maybe it was right after they started walking, or perhaps it wasn't until they'd almost reached the gate to the lower levels; but she wasn't really conscious of the contact until the latter.

They descended into darkness. An entire new level had been built to house the exhibit; they glided into it like a shuttle gliding through silent space.

Ben's touch on her arm startled her. "Are you all right?"

She sensed him watching. "I'm —OK. It's just a little creepy. I've never liked darkness."

The elevator stopped, and the doors opened with a soft *whoosh.* To reveal. . . .

Ben waited for her to reclaim her senses before explaining, "Supposedly, this is what you would see if you stood on the surface of the Sun and looked upwards. Pretty amazing, isn't it?"

She looked down reflexively, and pulled in a breath so sharp it hurt her lungs. An ocean of hot plasma boiled sullenly beneath filters that permitted only the alpha hydrogen light through. Ghostly prominences and solar flares swirled around her.

She gazed upwards and outwards. All around them planets shone with the reflected solar fury. Venus was the brightest of them, a yellow gem Lisa felt she could reach out and pluck out of space. It was followed by the only slightly less brilliant jewels of Mercury, Earth, and Jupiter. Beyond that—she could not pick out Mars and Saturn from the backdrop of stars and the broad pale river of the Milky Way.

She left the breath out. "You could have warned me."

"What kind of sadist do I look like?"

"We can stroll around, can't we?"

Ben nodded readily. "It's all just a great big hologram. Things aren't as far away as they look. Here, I'll show you."

He took her by the hand again, and they stepped off the platform and started towards the jewel of Earth. The sapphire grew into a blue world with churning white clouds much faster than she expected. They even passed directly through the Moon; maria, mountains, Moon bases and all, as though they were all made from vapor. A hundred thousand kilometers high, they hovered over the graceful sphere, two omniscient aliens studying mankind's home like a biologist studying a drop of pond water.

Similar reverence was paid to the other planets. They spent several hours, neither speaking, each seeming to know the other's thoughts simultaneously. Finally, they returned to the elevator, and rode the silent shaft back to the world they had come from. That world was close to night itself; twilight had already begun to distort its solidity into shadows and murky shapes.

"Well? What did you think?"

Lisa shook her head at the impossibility of answering that question. "I used to wonder why people bothered going out of their compartments at all; why they didn't just cyberlink into the net, and have anything they wanted that way. But somehow—I'm sure we'll never do that. We have to get out of our homes, out of our own selves, at least once in a while. I suppose it's biological. Something we're driven to do."

Ben pursed his lips. "Biology is destiny? What a depressing thought."

They were walking past the same bench they'd ate at. She made them sit down again. It suddenly felt cold in the gathering evening, and she huddled up next to him. She said, "I keep thinking about the Strike. You'll never convince me the issues involved couldn't be settled in a single hour if all sides wanted to. Instead . . . every time I think about where it's heading . . . maybe it was inevitable that once there were enough shimps we had to start thinking of them as a threat. It's like there's this territorial part of our brains that we can't ignore however hard we try."

Ben had been listening intensely. Now he pulled away and rocked back on the bench, and looked to be chewing hard on her observations. Finally he said, "So, what you're saying is, homs can't share the Universe with another species. Even one of their own making." He silenced her objection. "That is what you just said: Homs have to expand their territory, no matter what alternatives are offered them; and they can't co-exist with other species."

Lisa couldn't argue. That was exactly what she had just said, in almost as few, blunt words. It was shocking to hear such a concession from her lips.

"Then I retract everything I just said."

"Why?" he demanded in sudden heat. "Because the only logical conclusion is too horrible to contemplate? That's a stupid reason. Or —don't you have the stomach for a real fight?"

She realized she was shivering hard, despite her best efforts. The Qi Pao was not much protection against the night. "It's getting late—"

Ben stood up abruptly, in a jerk that made her start. "I'm sorry. I wasn't trying to frighten you." He smiled easily again. "I'm afraid that was the cynical part of me getting out."

He put his hand out, but this time she refused it. They walked back to the Columbus Circle gate in silence, a walk which seemed to take hours. When she passed through it she felt as though she were entering sanctuary, although it was just as dark outside.

Ben put out a stiff hand. He said, "Well, thank you for going out with me, Lisa Jiang. As usual, I had a most enlightening time. I hope to see you again some time."

Then he vanished into the night.

"... Ready here, the Voice of Reason, the Defender of Decency, the Trumpet of Truth. It's time to let the little guy toot...."

"... Have everything they need. Not everyone can say that. There are still millions of poor people down here...."

"... Made it all possible anyway? Us, that's who. We did. And now they think they can lord over us. Like we're sub-human, or something. I say it's about time they started considering how they got where they are in the first place."

"OK, maybe it is partly our fault. Or even all our fault. The point is, you can't designate certain groups victims, and then give them all kinds of special privileges just to make up for...."

Strange, that she hadn't dreamed about Allison before. Of course, perhaps she had, but didn't remember. This dream popped her wide awake, the girl's crying echoing from the walls around her. A moment later the ugly metallic thing would have come down....

The sheets were damp, and her compartment smelled of animals fighting; sweat and fear and the musky scent of hormones. She sat up and ordered the lights on. Civilization surrounded her again, driving out the barbarians. She pulled herself from the sticky sheets, went to the bathroom, and then walked around for a while, fighting to calm herself.

She made some tea. "Ouch!"

"Are you injured, Ms. Jiang?"

"No. I mean, yes, I just burned myself. Medical attention isn't necessary." She flicked on the faucet and plunged the angry flesh into a cold stream of water. Where was that salve?

"Are you certain you don't require medical attention?"

"It's only a first degree burn." The shrieking pain vanished at the first touch of the salve. It would be healed in an hour.

The whistling kettle disrupted her thoughts. She poured, with extra care, and sat down with the dark liquid. Chinese dragons, glowing red and yellow from the heat, romped playfully across the ceramic surface of the cup; another gift from the past.

The pad was whispering softly in the background: Reed Ready's slivered voice cutting through another victim. "What *we* owe them? Perhaps I should remind you of certain facts about our shimp 'brothers.' It was the World Court which ruled that ending shimp production was a violation of their rights as a sentient species; that we *had* to increase their population to the point where they could threaten us—excuse me, I mean 'Participate as a significant faction in society....' An opportunity they promptly took advantage of by muscling out the hom belt miners. So, so much for your greed argument; that's just another feel good guilt trip."

"Turn that crap off!"

The voice slithered back into the city noises outside. Lisa sipped the tea, still scalding hot. When? she wondered. When will the powder keg blow? Tomorrow? Next week? Year? With enough fools like that caller, sooner was a better bet than later. Strange as the alliance sounded, both Ben and Ready were right on that point: species guilt, hom or otherwise, was an irrational concept that only obscured the real issues. And Ready was perfectly correct in his facts, as Ben had warned her, shimp production was being phased out when the Court made its bizarre ruling. As for the hom miners being "muscled out," strictly speaking that also was true. Of course, if Ready knew that he also knew how those shimps came to be in the position of muscling anyone.

*Someone ought to speak up....*

She closed her eyes and saw Allison.

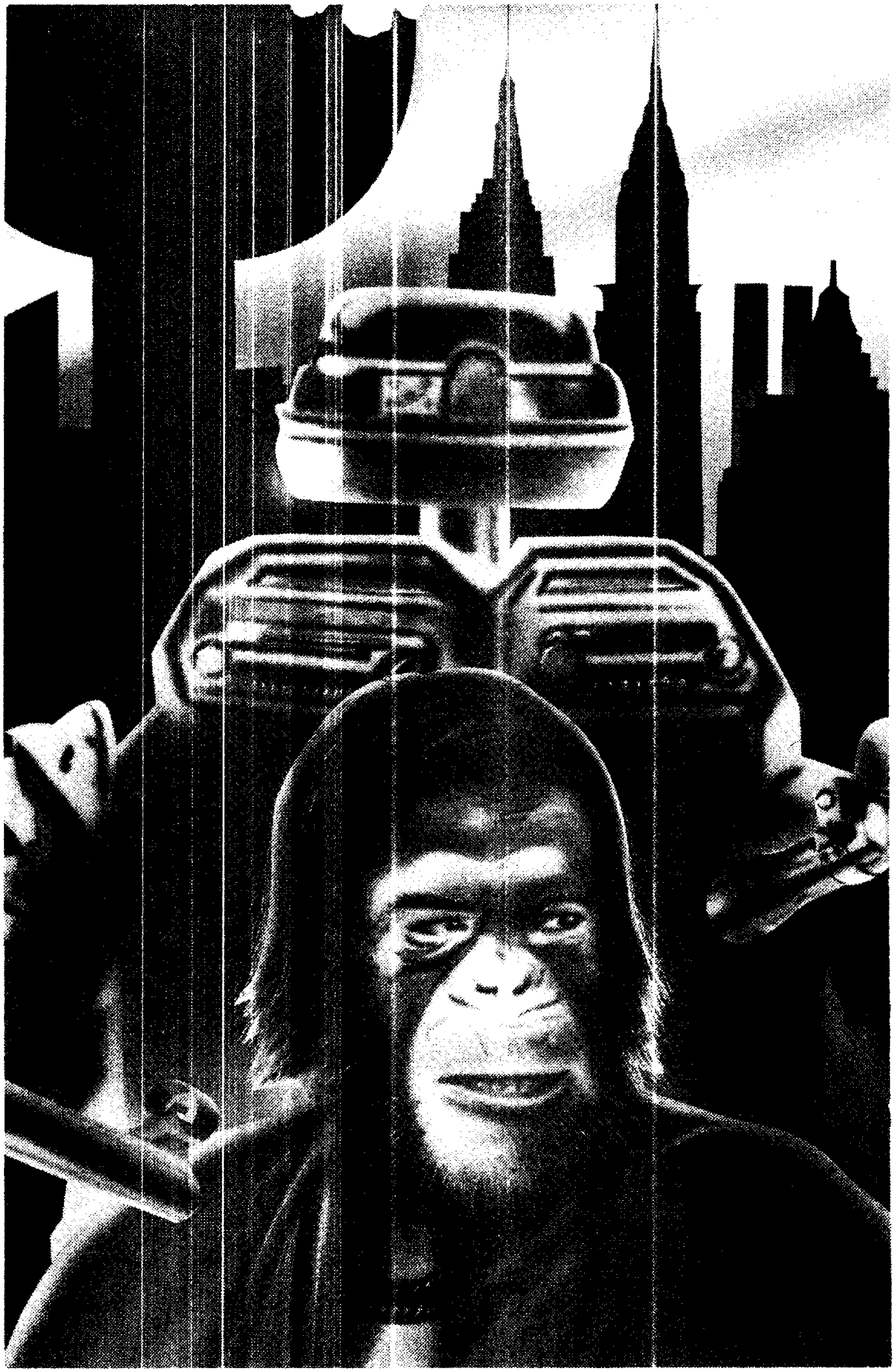
"We interrupt to bring you this special report. The United Nations Security Council voted this morning to recommend economic sanctions 'Against all non-terrestrial trade organizations, individuals and states...' a resolution that was quickly ratified by the necessary two-thirds majority of voting members. The resolution further stated that... it was emphasized that 'although this should not be construed as a military or in any other fashion hostile act, its provisions will be enforced by appropriate instruments of defense.' The resolution was swiftly denounced by...."

The worst thing was the way everyone seemed to carry on as if nothing had happened. If anything, there was an enormous relief, like a giddy fog, swirling about the people she passed. Relief that the inevitable had at last happened. That something was finally being done—good, bad or indifferent didn't matter anymore. It was a fog the people seemed to breathe deeply without even being aware of it.

Even the children were intoxicated. Lisa had to be cross with Erin three times before the morning was half over, finally banishing the boy to the hallway. He soon had company. It was as though hyperactivity had become a contagious disease. One after one, the innocent faces were evicted. Finally, she found herself screaming at them.

She'd never lost her temper with her children before.

A day's torture later, a torrent of small bodies exploded from the classroom, and she was left alone with her thoughts. *What thoughts? What's left to think about?* All her life she'd wanted to teach, and now—why? What was the point? There was an invincible, if transparent, door between the student called humanity and the lessons it needed to learn: transparent because you could see through it, but invincible nonethe-



less. Sisyphianly invincible.

"He isn't very important now, is he?"

She jerked toward the doorway. Julia L'uboleng walked in and sat down at one of the tiny desks. Strangely, she seemed to fit in it.

If the woman had had fangs—"They came for him this morning, about an hour after the vote. Ben was one of the first. They're all pretty well rounded up by now."

It was like having your neck broken without any warning. Everything from mid-thorax down went instantly numb. "Wh—what are you talking about?" Lisa felt the world swirling, and grabbed hard on the edge of her desk to steady herself. "What do you mean, rounded up?"

The fangs glinted in the room light. "I thought you were an historian. What's the first thing governments do after they declare an emergency? Arrest the enemies of the state. Spies and saboteurs are everywhere, you know. Even your neighbor, or best friend, or loved. . . ." She stopped in mid-choke. "Meanwhile, I do have some pleasant news." She stood up, and brushed the wrinkles from her cramped clothing. "I'm here to inform you that the board has voted to release you from our employ." She paused, to let the news sink in. "As an ex-citizen of one of the sanctioned states, it has been decided that you represent a potential security risk; too much to be entrusted with the education of children."

Lisa didn't know how to react. She knew her mouth was half open, but it would neither close nor emit intelligible noises. What she was being told was impossible, utterly impossible. Ben arrested? On what grounds? By whose authority? Under which laws? How. . . .

The dying rap of Julia's heels echoed through the emptiness of Lisa's mind. In her most frightening nightmares she'd never imagined something like this happening. People weren't arrested simply because of who they were anymore: that was one of those horrors which really had been done away with, like dictatorships and labor camps and—and yes, now that it came to mind, war. Arrested? Ben might as well have been sent to the guillotine.

Lisa realized her heart was racing, pounding thick blood into her brain. She shook off the coma that was starting to settle on her like a blanket, and fought to think about what she should do. But she couldn't think; ideas flared and faded out before she could focus on them.

Closing her eyes, she breathed deep full cycles, over and over again, until her senses returned to clarity enough that she could think. What *could* she do? She had to speak to someone. The proper authorities. Demand that they release Ben . . . remind them that there was no clause in any article of any constitution in the entire Solar System which gave anyone the authority to hold a citizen against his will. And if they didn't listen, take it higher. All the way to the World Court if necessary.

New York blurred by as she raced back to her compartment. She practically screamed at the pad, her throat already hoarse from the sobs she'd been fighting.

The pad could give her no information on shimp detainees or their whereabouts.

The claim didn't register at first. It was just sounds in the air which made no sense. Even when it did coalesce, it took several moments to compose a response. "Withholding information on government activities is a violation of the UN Constitution. I order you to tell me!"

The pad's voice seemed to crack under the strain of conflicting internal logic: "I'm afraid I cannot comply with that order, Ms. Jiang. I—" it could continue no longer.

She blinked back disbelief, and forced herself not to hyperventilate. The idea of not being able to contact or locate someone, or learn anything about his status or fate, was so inconceivable she could find nothing in her experience to deal with it. *You mean, he just doesn't exist anymore?* She didn't know what to do: whether to cry, laugh hysterically, go on a murder rampage, commit suicide or huddle in a corner, rocking autistically. Or carry on as though everything were normal.

There was only one thing she could think to do.

"Call Julia L'uboleng."

She was just about to cancel the call when an indignant face and clipped, strawberry hair appeared. "What do you want?"

Lisa almost blurted out, but stopped herself in time and measured her words cooly. "You said they came for him. Who came for him?"

"What do you mean, who? Men with uniforms and weapons. I didn't get their names. And no, they wouldn't say where they were taking him. Now, if you don't mind, I am very busy."

Lisa didn't hear the last three sentences. "The uniforms must have had something which identified them. Insignia or labels or something like that." *How could you have missed that?!*

L'uboleng looked blankly astonished at the suggestion before answering, "I confess, I was too upset at the time to notice anything like that." She cleared her throat. "I don't see how it would do any good if I had. What are you going to do, call them and politely ask them to release Ben? You have some very amusing ideas, Ms. Jiang."

The woman's coldness, not to mention sense of hopelessness, was infuriating. "It's better than sitting around doing nothing!"

Julia closed her eyes. When she opened them they bored directly into Lisa's, delivering the thought her mouth would not yield. She said, as terminally as possible, "If you have a proposal, I'm willing to listen."

Lisa broke the eye contact. *Put up or shut up: I couldn't have said it better myself.*

"I rather thought that. You're wasting my time, Ms. Jiang. Good-bye, again."

"No!"

The connection remained alive.

Lisa knew it wasn't much. But it was all she could come up with. "I'll make you a deal: I'll keep you informed of anything I find out, if you'll do the same for me."

She wouldn't have thought it possible for that face to get colder. "Why—should I cooperate with you—on anything?"

*That's a hell of a good question.* "Because—because you care about him, and because you know I care about him, too."

She was sure Julia would have spat at her if she were standing there in person. "I know about your kind of caring. It's not as admirable as you think it is."

Lisa felt her chest twisting in on itself, crushing the life out of her. "I'm not going to sacrifice Ben for some cause," she pleaded, "if that's what you're worried about."

Julia leered her disdain. "Not going to? You've already sacrificed him. Why do you think he was one of the first arrested? Did you think a shimp cavorting around in public with a foreigner wouldn't be noticed? Or don't you believe in discretion?"

Lisa rocked backwards with this fresh attack. There was a frightening amount of truth in this one, too: she had been so impressed by Ben's forwardness that it had never occurred to her she might be endangering him by indulging it. Perhaps the right thing to do would have been to turn away, even if it meant looking like just another bigot. Instead . . . Allison, all over again.

"Do us all a favor, Ms. Jiang. Lock yourself in your compartment, take your maintenance, live to a ripe old age, and die in obscurity. You might manage to not hurt anyone that way."

The connection was broken brusquely.

Lisa looked down at her hands. They were wet, and not very steady either. They seemed to rock in a rhythm with her heart. *Now what?* She squeezed all her emotions into a tight ball, into a furnace of fear and rage and helplessness, not knowing who to damn first, or the most, but knowing that it needed someone to direct its fury at before it detonated.

Reed Ready popped into her mind first: if it weren't for egotistical bastards like that, feeding off of the mass frustration of people caught up in forces beyond their control, perhaps the situation could have been handled in a civilized manner.

She sighed and released the ball. Of course it wasn't really true: the Readys of the world were only the plexus of that world's nerves, not its chemistry; not what fired it. Indeed, perhaps things would even be worse without him: you certainly couldn't listen to him without learning something, or argue with him without being forced to think. Which was a hundred moral light-years beyond the rabble rouser he seemed to like pretending he was. And there was a lot of potential in that: if people were forced to think, then there was always the possibility of them thinking the right way. . . .

There was a thread she could grab hold of and hang onto. If enough minds out there had been primed—if she could just find the lever to move them in the right direction—if she could just reach enough of them—

She bit her lip, while hope and fear

spun through her mind.

The Voice of Reason was a man of principles. That was the answer. The only question was: which principles?

". . . The enemy of enigmas and mental enemas, the usurper of unreason, destroyer of docility. Well folks, they've finally done it. . . ."

"And it's about time too. A bunch of spineless bureaucrats, that's what they are. If they had any guts. . . ."

". . . How they'll make out without us. They'll come crawling back, believe me. . . ."

The figure in the doorway didn't look like the one she'd seen on the pad so often these last few months. Oh, it was Reed Ready all right: there was the thinning brown hair, the furrowed forehead and drooping eyelids that had dispatched "the enemies of unreason" with such frightening regularity. But here, arrayed before her as a live human being, those same features gave a different impression. It was immense guilt and inadequacy before the world's suffering.

"Mr. Ready?"

"Ms. Jiang."

She was led to a vast sitting room in the old Victorian house, where a bot politely offered her a selection of refreshments, bowed deferentially and disappeared when she declined.

"They are very much like real servants, aren't they, Ms. Jiang? So much so that it frightens me: the World Court may someday discover that we're violating their rights too."

Lisa restrained herself. This was Reed Ready all right. "I want to thank you for giving me your time, Mr. Ready. I realize you grant few personal audiences."

Ready squirmed in his chair. "Not too many people have ever requested an audience the way you did, Ms. Jiang. It left me—breathless is the only way I can describe it. I decided I had to bring you here, so I could convince you in person just how wrong you are. I'm not a bigot."

The man was shaking. He was doing his best to control himself, but the convulsions were visible beneath the tweed and the measured breathing. Like the patient endurance of injustice about to explode. Only his voice was in command; it sounded as right and confident as always.

Lisa fought to keep her own trembling invisible. "You don't understand, Mr. Ready. I didn't think you're a bigot. It wasn't my intention to make you think I believed you were."

Ready raised an eyebrow suspiciously. "Then what, exactly, was your intention?"

She steadied herself with a breath. *Here it goes.* "Have you ever heard of busing?"

Ready pondered a moment. "That was a scheme used in the late twentieth century to end racial segregation in the public schools. Students were transported to schools outside of their neighborhoods in order to achieve integration of the school systems."

To the extent that history is facts, the man did know his history, Lisa had to grant that. She nodded. "People thought busing was necessary because the neighborhoods themselves were segregated. The problem was, in the eyes of the parents, busing meant having their kids dragged off to schools many miles away. It meant losing control of their children's education. The fact that it was often done by force, by a court order, only made it worse.

"The result was, a lot of people opposed busing—sometimes to the point of violence. But to the scheme's proponents, the opposition was seen as pure racism; white bigots who didn't want their children mingling with non-white children."

She thought Ready was going to interrupt her. But he remained in his seat, listening intently, his trembling down to a thin shiver.

"The thing is, both sides were right," she continued. "Some of the resistance was racist. And some was legitimate. Worse, no one could really separate the two anymore. And all that did was to legitimize racism; to let it hide behind real, understandable fears."

She folded her hands on her lap. "The point is, the result of an attempt to end racism was to strengthen it. Neither the proponents nor the opponents of busing intended that result. But that's what they got; because it was the logical consequence of their ideas and actions. Every historical analysis I've seen has concluded that racial prejudice lasted longer than it should have as a result of the attempts to end it by force."

She ended the lecture there. There was no point in dragging it out further; either Ready got the message, or he never would.

Ready didn't respond at first. Finally he asked, "Are you sure you wouldn't like something to drink, Ms. Jiang? I have some very good wines." The house bot appeared, as though a law of nature, at his side.

When the bot was gone Lisa started to say more, but Ready stopped her. "There's no need to labor the point, Ms. Jiang. It was well made. You think what I do has the effect of legitimizing prejudice against shimps, even if I am not prejudiced myself." His trembling had disappeared, and he was in command of himself again. He even had a little smile, a smile that made Lisa squirm inside, that suggested she'd made a fatal tactical mistake and handed Ready ultimate victory. "It is a far more flattering assessment than I get from most of my enemies."

She sat up, hopeful for the moment again. "Then—you agree?"

Ready folded his hands across his stomach. "In theory. But your little history lesson has overlooked something; namely, that it *is* history." He blinked immense eyes at her. "The analogy between racial minorities in the twentieth century and shimps in our own won't hold up. First, the cyberlink recording you sent me aside, we've come a long way from the Ku Klux Klan and Jim Crow. Second, shimps are a different species; they're not just human beings with different cosmetic features. They wouldn't exist at all if it weren't for us; which ought to give us some right to a return on our investment."

The bot reappeared with their orders at this point. Ready dipped a finger in the red liquid and ran it around the rim.

Things were getting out of hand. Lisa knew that if she started arguing she would not get what she had come for. She had to force the situation back on course. "Some right," she said. "But not an overriding right. You agree that shimps have rights too."

Her host's hackles shot straight up. "You've never heard me say that they don't. That's one of those lies. . . ." he calmed himself with some wine, then went back to rubbing the rim— "I refuse to dignify the charge by denying it." His eyes smoldered and consumed their sympathy. "Where have their rights been denied?" he demanded. "No one ever points to an example where they have been. If someone ever does, I'll join in the protest too."

"What about their denial of citizenship on the colonies?" Lisa pointed.

Ready shook his head. "That's a textbook example of muddled thinking. Those shimps were paid highly for their labor. As for the colonies, what they needed was a highly intelligent, educated citizenry, not simple laborers. Let's be realistic; few shimps fit the bill. Those that did, stayed; those that didn't used their high pay to start the mining companies that pushed the homs out of the Belt. Incidentally, nobody ever calls that a violation of anyone's rights."

Again, Lisa had to refrain from what she wanted to say. She had to keep Ben in the front of her thoughts, no matter what provocations he threw at her. "Actually, that's not the issue I had in mind." She put her own glass on the table beside her. "Are you aware, Mr. Ready, that the UN government has been arresting shimps and holding them incommunicado?"

Ready stopped his rim-rubbing. Anger flashed momentarily on his face, then an icy calm descended. "May I ask, Ms. Jiang, who told you this?"

History crashed through Lisa's mind. *Of course, the existence of victims must be denied. The Holocaust was a Jewish hoax. Slavery was good for the African.* Here there would be no escape, however. "I'll need your pad to answer that question," she baited him.

"My pad?"

"Yes. Or are you afraid?"

"Afraid? Of what?" Ready scoffed at the suggestion. "Your accusation is absurd. The government can't arrest citizens and conceal their whereabouts. Even shimps."

Even shimps. How many people said it, thinking it was an enlightened attitude? "I'm not asking you to believe me, Mr. Ready." Despite herself, Lisa couldn't resist a grin. "Believe yourself. You keep telling us how foolish the government is. How we can't trust it. Well, do you believe your own words or don't you?"

Ready tried several replies before, lips tight, conceding the skirmish and turning to his pad. He quickly made the same discoveries Lisa had made earlier; the only difference was this time the pad went blank and silent when he ordered it to divulge the information.

A cold fury condensed on the man's features. That the pad wouldn't tell him what he wanted was obviously too much for him to accept. More than it had been for her, even.

Lisa knew she shouldn't say it, but did anyway. "Ready to join in the protest?"

Her host turned back to her. He practically spoke through clenched teeth, as though he wished he could bite his words in half. "I agree this is highly irregular, to say the least." He added, "It would seem worth investigating."

"Investigating?" She couldn't believe what she was hearing. "The question is, what do you intend to do about it?"

"Do about it?" Ready looked at her in incomprehension.

Lisa mentally pinched herself as hard as she could. "If there was ever prime material for the Voice of Reason, this is it. A perfect example of government acting like it can do whatever it wants, and get away with it." *And you know it.*

The way her host looked away, she knew he did.

"I suppose...." Ready fingered his chin thoughtfully. "I could fit it into my next show. You're right: we can't allow the government to get away with hiding what it's doing with shimps from the people. Who knows what deals are being cooked up behind our backs?"

It took a moment for Lisa to ingest the words. When she did, all the could do was form her lips and emit a silent, "What?!"

She got no further, for Ready had already stood to dismissal. "Yes, I think I will make use of this new outrage. I can't believe I didn't think of the angle myself: they're only pretending to finally be doing the right thing, while they're really screwing us. It's the ultimate con job."

The bot was beside him again. "I want to thank you for bringing this to my attention, Ms. Jiang. I assure you, I will find an appropriate way of expressing my gratitude. Now, if you'll excuse me, I have a show to prepare for."

To her own chagrin, she accepted the handshake. A moment later the bot was showing her the door; and she was doing nothing to stop it....

She sat on the side of bed, her head cradled in her hands. Periodically, she ran her fingers through her straight, black hair, pulling it hard at the roots.

If Julia L'uboleng had stepped into the room right this moment, pointed a gun at her and pulled the trigger, she could not say it wasn't justice. *All you've done is stick your nose in where nobody wanted it, and all that's come of it is more misery.* She was starting to understand how a certain character out of cartoon history, who walked around with a black cloud following him everywhere and bringing ruinous luck to all he encountered, including himself, must have felt. Everyone she'd touched was worse off than before she walked into their lives and messed up working, if less than ideal, arrangements. The only good thing that could be said was that at least she'd suffered too, if losing a couple of jobs amounted to a measure of suffering compared to what she'd inflicted.

*And the worst thing is, all I've tried to do is the right thing.* Somewhere, malicious gods had to be laughing at her. That was the only possible explanation.

*Sure, that's right: it isn't your fault. It's God's will. Destiny. Karma.*

It was hard to believe that all her efforts should backfire so completely and spectacularly by accident. It did seem as though she were fighting some perverse law of nature, which said that the evil accomplished was in direct proportion to the good attempted. Or something like that. What was that phrase they used to use? Murphy's Law? No, Murphy was supposed to be an optimist. So who—it didn't matter.

*So, maybe I should try evil.* No, somehow she was sure that wouldn't work either. Ready's tactics could not possibly lead to good end, however perverse the Universe was. Murphy's Law, or whatever it was, was not symmetric. In fact, that was part of the law, now that she recalled.

Or was it? Lisa sat up straight suddenly, her head slipping through her fingers.

*"It's a free society; the Readys don't prosper unless people want what they're selling. People filled with love don't buy hate."*

*"But if hate is being shoved down their throats, day and night. . . ."*

*"Try telling them that."*

*"Maybe nobody has—"*

She was breathing too fast. She squelched her thoughts long enough to make tea, and sat down at the kitchen table with long, contemplative sips. Oh, how she wished Ben were here! He would know exactly what to do, she was sure.

*". . . Nobody I know ever heard of Reed Ready and the Voice of Reason until the Strike, although he must have been living in some little hole in the net somewhere."*

So what was stopping her? If Reed Ready and his Voice of Reason could come from nowhere to being heard by millions, why not hers? If he could use the net to poison minds, why couldn't she use it to cleanse them?

*Who are you fooling? It's always easier to sell hate than love. Or even simple tolerance. People enjoy hating too much.*

Maybe that was because they hadn't been shown the consequences of hating yet. The German people enjoyed it too, until they were shown the pictures from the concentration camps. Maybe if the people of Earth were to see the dead end of the road they were being led down—if enough of them saw, and understood, then maybe: they might slow history down, slow it down just enough to keep hope alive. Enough of them, working together or even alone, might divert, distract, and delay the inevitable long enough to raise the possibility of postponing it even further. Long enough to get a movement going. Then, perhaps—perhaps they would postpone it forever.

And if it did happen, it would have to start with one person. Someone, somewhere. A desperation that no amount of defeat was able to prevent it from trying again.

Why couldn't that person be her?

*Why not?*

*Even when there's no hope?*

That was the beautiful thing about it. You didn't need hope. Only life.

She sat cross-legged on a grassy hillside, in the bright sunshine. A warm breeze tugged rivulets of long, black hair; the silk of her *Qi Pao* billowed and flowed in the same river. Her hands folded across her lap. She smiled easily; but her face was deadly somber and serious, the face of classrooms and earnest lessons.

"I want to thank you for giving me the time to speak with you on a very important issue. But first, let me tell you who I am: I am an elementary school teacher. Excuse me, I *was* an elementary school teacher. I taught for seven years on the Lagrange colony; what you would call the grange. But for the last few months I have been Earth-side, where I was born and raised."

Lisa shifted uncertainly in the grass, hoping that her words would sound as good in her mouth as they had in her head. "By now, many of you have noticed that I am of Chinese extraction. But others, perhaps most of you, haven't noticed it, even though I have emphasized the fact by wearing what was once known as traditional costume. Indeed, you probably find it incomprehensible that anyone would notice something like that; there is nothing remarkable, and certainly nothing frightening about it, you would say. We're all human beings, after all.

"But there was a time, not too long ago, when you would have noticed it instantly; and when many would have been disturbed, or even frightened or angered by it. To a number of you, I would have been seen as a threat: a threat to your prosperity, to your security, perhaps even to your neighborhoods or families. Or even to your own lives.

"If such a reaction seems barbaric to us now, that is because our predecessors worked hard to overcome it. They literally rebuilt civilization, to where consideration of anything other than an individual's abilities and character was repugnant. We're all one big, happy human family, thanks to them. And the result has been a Pax Humana, that first spread across the face of the Earth, and now is reaching to the edges of the Solar System.

"Or is it? The recent strike by shimp miners in the asteroid belt, and the reaction of our UN to it, has clouded this bright future. And there have been other events connected to these developments: events not as dramatic, but perhaps even more indicative of the dark side of our shining civilization. Events that show how many of the old evils are still with us, and still hungry to grow back into the horrors they once were."

Lisa shifted again, and licked her lips nervously. Reed Ready was out there, somewhere, watching and listening. He could denounce her afterwards, twist all her words and make the millions who'd heard them forget what she really said.

But he couldn't steal her words from her. She took a deep breath, let it swirl around in her lungs and recharge her blood, then let it out gradually. She continued, "But first, I want to share something else with you. I said I taught on the Lagrange colony for seven years, up until recently. In fact, for the last year, I held a highly prestigious position in research. I am here today because I was dismissed from that position. When I say here today, I literally mean that: where I am at this moment, speaking to you. Because I must share with you the reasons for my dismissal; the events which led to it.

"The reasons involve the strike, and how I came to hold such a position in the first place," she told them. "But, more than anything else, it involves a young girl, a child. A person who paid the ultimate price because she was too innocent to know the rules.

"Her name, if it matters, was Allison. She was a bright child, not the brightest I've known, and not in all areas—her language skills were a year behind those of her classmates—but she had unusual facility in mathematics and the sciences. I should add that there was a time when such abilities in a girl were frowned on, or worse, cause to regard her as something evil. But we live in enlightened times; no one is treated as something depraved or foolish merely on account of sex—that is primitivist thinking, straight out of the medieval age.

"Or is it? Every year there are colony-wide academic competitions among the schools, to see who is the best and brightest in the different fields. It's meant to be a friendly competition; none of the children are forced to enter, and no stigma is attached either to those who decline or who end up low in the final standings. The sole purpose is to encourage academic excellence.

"Of course, that is an idealistic description. People being people, in reality the competitions are not as noble as we might like. Where there are winners there must be losers: those who know they didn't measure up, who must be content with the left-handed compliment of having tried their best. Much as we would like to deny this unpleasant aspect of competition it is always there, bubbling beneath the surface in hot, if carefully hidden, resentment."

*Not bad. Maybe I should go into this trade full time,* she thought. Instinctively, she stood up, turned to the side and faced the sky. "That resentment is always greater when the winner is different in some basic way. When she is like us, we can identify with her and her triumph; we can say 'we won' and feel that superiority that is always the real reward of victory. But let her be different enough, and we have nothing. We will simply have to take our back seats. We will have to sit on our resentment, and let it smolder painfully, with too much fuel to go out completely but too little air to flame up and satisfy itself.

"But what if there are only a few of her, or even only one, but many of us? Then we might decide that something is fundamentally wrong here. And what if, in addition, we have always taken her kind to be inferior to us? Then the idea that this person has committed some kind of crime is even stronger; after all, she has disturbed the natural order of the Universe—Things As They Ought To Be. She becomes an invader. An alien who will destroy everything if we don't cast her out. Or destroy her first."

She struggled to contain her tears, but they rimmed up and eased out onto her face, blurring her makeup. "The child I am speaking of—Allison—was destroyed in just this manner. Destroyed because she scored highly in a field where her kind was not even supposed to walk.

"She was destroyed by the other children. Of course, those children didn't know what they were doing; they didn't realize what a hard object can do when brought down on a skull with all of even a human child's strength. All they knew was that they hated her, too much for the why—even if they had some dim awareness of what I've described—to matter. They hated Allison for stealing what they regarded as theirs by right. Hated her because she didn't know enough to play by their rules, or even what those rules were." *Because you wouldn't teach her those rules,* a voice screamed at her from inside. "They hated her because she wasn't human in their eyes. She was a pan. A shimp. That was enough."

She allowed her words to sink in. "That is why I am here today. Nobody on the colony wanted to accept the real reasons for Allison's destruction. How could they? They were the cream of humanity, the elite of the elite; it was impossible that *they* were guilty of such things. Groundhogs, perhaps; but not them—not the heirs of humanity's bright future. They were too far beyond such Neanderthal mentality.

"So I returned to the world of my birth. I tried to put Allison behind me. To forget. A cowardly act, I suppose, but—

"But you cannot escape evil. Evil is never dead, and it is always hungry. Feed it, even without meaning to or even realizing that you are, and it will become a monster again. I came here for sanctuary, but what I found instead was the same monster, albeit in a different form, feeding away right under the noses of the people.

"That's right. It's here, too. Even as I speak to you, it is exercising its claws; raking them over its first victims, to see whether they'll hold fast. And it has selected those victims well: it knows that between your fears and your confusion over the issues involved in the strike—confusion it has carefully nurtured—you may be tricked into thinking that all pans are a threat.

"That's the way Hitler got started. Eliminate the undesirables. Of course, we all know that the list of undesirables never stops growing, until it has found our neighbors, our loved ones and ourselves. Everyone becomes a threat, eventually. Because the monster is never satiated. It won't stop to lick its claws until civilization is one vast prison camp; and even then, it will hunger for more."

Her voice had begun to roughen. She cleared the phlegm that had gathered in her throat. "I realize I am not telling you anything you don't already know. But sometimes we lose the difference between knowledge and knowing. We start taking things for granted. Like the disease we cease to inoculate ourselves against, thinking it is a thing of the past. That's the most dangerous time. That's when the evil turns out not to be dead at all but merely dormant; waiting, watching for the chance to live again. The history of war is filled with battles that were lost because the would-be victor enjoyed his triumph too soon.

"I pray that will not happen to us. But whether it does, depends on all of us. I am just one person; I haven't the strength to move history by myself. No one person has. But together, we can move it, against any force. We can choose a hopeful future, or a hopeless one. But whatever it is, the choice is ours. I can only pray that it is a wise choice.

"Thank you."

The swirling blue and white orb of the Earth swam in space before her. A beacon of intelligence in an otherwise dead, though beautiful, Solar System. The orb was completely dark nowhere: even the side away from the Sun throbbed with bright energies.

Lisa felt as though she could reach out and embrace it, as though it really were the great mother Gaia of mythology. But she knew, rationally, that that was impossible; that the chimera would evaporate at the touch of any sense save sight. An Earth like this could only be envisioned, never loved. Never felt. That was what was wrong with it. In the end, it wasn't real. It didn't have grass between her toes. It didn't have life.

She sensed the presence behind her, and turned to meet it. She squinted in the sunlight.

Julia L'uboleng emerged from her silhouette, and walked up to the sapphire world. She pushed her hands into it as though it were a cleansing wash.

"It is so much like the real one, isn't it?" she observed. "Not at all like children. Children you can touch easily. This—" she dropped her hands—"requires long term commitment."

Lisa stepped backwards, disoriented. "You—how did you know I was here?"

Julia looked at her probingly. "You really can't figure that out?" She sighed, and shook her head. "All right, I'll spell it out for you. Despite outward appearances, the relationship between Ben and myself is not that of boss to underling. *Verstehen Sie?* Do certain things suddenly make a lot of sense all of the sudden?"

Lisa felt her mouth falling open, and shut it. *Yes, a lot of things make sense now.* Her mind swam in a maelstrom of absurdities, a vortex which threw a wall up against the world. *They're lovers?* She had heard of such things, had even suspected on several occasions, but....

*But what? Are you saying it's immoral, unnatural, perverted? Why?*

"You don't have to work so hard not to look horrified," Julia said, without emotion. "To be honest, until I met Ben, I would have reacted the same way. And seeing how hard Ben was working you over—well, never mind that." Her face was dark with pain momentarily. "I didn't come here to fight you for Ben; I came here to fight with you for him. If that deal you offered before is still good, that is." She put out a hand. "If it is, I'm officially accepting it."

It was not easy to focus on the real issues, but somehow Lisa forced herself to. To her surprise, Julia's hand was not ice cold.

"I was wrong to blame you for what happened to Ben," Julia suddenly confessed. "It was no more your fault than what happened to that girl. The fault is with the people who go around preaching hatred. And with the people who, knowing better, are afraid to stand up to them."

Julia L'uboleng, *mea culpa*? If Lisa weren't hearing it with her own ears, she could not have brought herself to believe the words.

Believe them or not, however, she would not accept them. "If I had known what was going to happen, I wouldn't have stood up to them either. If I could go back and do it all over again—" *But you can't go back. You can't undo what is done. And you can't escape responsibility, one way or the other.*

"Maybe the trick is to be naive enough that you never suspect the worst," Julia observed. "That's what's wrong with me: I always take the worst for granted." She laughed bitterly. "And when it doesn't happen, I'm amazed things turned out as well as they did. Take that little lecture of yours; I'm surprised you haven't been publicly lynched yet. Instead, I just checked its audience rating. Would you believe it's up to a twenty-three?"

Lisa's heart practically leapt out of her mouth at this revelation. A twenty-three! Only in her dreams had she even gotten half that. "Are you serious? You must have read it wrong."

"Twenty-three and climbing. You've touched a real nerve, Ms. Jiang. Arresting shimps has turned out to be a real blunder for the government; even Reed Ready is condemning it, even though he's trying to make it look like a conspiracy between the miners and the UN bureaucracy. He doesn't realize how badly he's hurting his case: people don't know who they're scared of more now, the bugs or the men in uniforms. Add to that the magnificent way you played the groundhog resentment against grangers angle." Julia grinned wolfishly. "That was when I realized you weren't quite the innocent you like to play, Lisa Jiang," she concluded. "Either that, or you've got a born instinct for politics. One thing is for certain: the world is going to be demanding a lot more of you, a lot sooner than you think."

Lisa's mind spun in its cocoon. *This has got to be a dream. Or maybe I cyberlinked into virtual space and got lost somewhere.* She fought to breathe steadily, to keep herself from hyperventilating. To keep focus on what was important. "Does that mean . . . have they released Ben yet?" she demanded.

Julia gave her the same look that children give adults when they ask truly stupid questions. "Don't be ridiculous. It isn't *that* easy. But I do expect to start hearing pathetic rationalizations for the arrests soon: how it's for the shimps' own protection, and how it's only temporary, and so on. Evil always has to pretend it's really only dumb first, before it makes a strategic retreat."

*I don't care about that. All I want is to see Ben free. Let others fight the war.*

She knew it was foolish even as she thought it. *Lisa Jiang stay out of trouble?* She might as well lock herself into her compartment, strap herself into bed, and feed and relieve herself by tubes. Even then, she'd still manage somehow to end up facing the Fredericksons and Readys of the world.

"I'm not sure I find anything amusing in it, quite frankly."

Lisa realized she'd greeted her realization with a wry grin. She wondered momentarily if she should tell Julia what she'd been thinking. Or if it was necessary to tell her, for that matter. Instead, she said, "Isn't that sort of an old-fashioned word, evil? No one seems to use it anymore; at least, I haven't heard it since, since I was little."

Julia pursed her lips. "Maybe they should start using it again. Maybe with all the so-called progress we've made over the last century, we've also progressed away from some basic concepts. Ones we should never have forgotten."

Lisa nodded. "Hmmm. Maybe." *And maybe it's a concept we should resurrect.* She turned toward the phantom Earth again. It suddenly seemed smaller, and simpler, than it had before. She put her hands out, and watched them vanish in the bluish haze.

Julia was stepping backwards, as though to leave. "Well," she said, "I think we know how to reach each other, if anything comes up. Is—there anything else you need, Ms. Jiang?"

Without turning, Lisa answered, "I could use a job. I'm a teacher, you know."

*Sure. Just look where that has gotten you!*

She didn't quite hear Julia's reply, but it was something along the lines of, "I'll see what I can do for you." When she looked again, she was alone.

". . . Of Reason has returned, with another rollicking, frolicking session of UN follies. Only we're not having any fun at all; it's hard to laugh while the knife is sliding in between your shoulder blades. Not easy at all. But they're trying, grant them that. They're working our funny bones over as hard as they can.

"Serious, folks. I mean, what else could they possibly be trying to do, by telling us they're keeping the *shimps in protective custody? Repeat* after me: pro-tec-tive cus-to-dy. Sounds like a secret mantra. I think I'll try it next time I'm at the dentist's, instead of laughing gas. Imagine: all those poor shimps having to be protected from the likes of us? I don't know about you, but it makes me feel real dangerous.

"But never mind my delusions. The

net is open for your input. I want to hear the roars from all you tigers out there . . . wait a moment, let me get my whip first . . . yes sir, you're speaking to Reed Ready and every mind on the planet. What've you got to say?"

"Allison."

"Uhh—sure. Well thank you very much, brother. And speaking of brothers. . . ."

"Do you wish to return the call, Ms. Jiang?"

Lisa sighed heavily. It was the third legitimate interview request this morning. Add to that the less than legitimate requests, not to mention the inquiries into her political ambitions, the bizarre ramblings whose point was utterly beyond her, the straightforward crank calls and, last but not least, the threats to life and limb, and she decided that hell must consist of being asked that question over and over again.

"No, not now. Hold it in the queue, with the others."

Her phone icon was flashing again even as she answered.

"News. The Strike. The UN sanctions."

The smiling newscaster told her nothing new, nothing she didn't already know. *God's in His heaven; all's right with the world.* Julia was right. It wasn't going to be that easy.

"How about the shimp detainees?"

"The government believes it would not be wise at this time to release the terrestrial Pan population from protection. However, it is considering permitting limited contact at some point in the near future. Stay linked for details."

Lisa wanted to cry out for joy. *No, not easy. But possible.*

"Do you wish to return the call, Ms. Jiang?"

"No. Put it in the queue. Open my mail. I want to read Julia L'uboleng's letter."

*Dear Ms. Jiang:*

*It is my pleasure to extend to you the opportunity to return to the position you previously held in our employ, with the same status and salary. This opportunity is effective immediately. If you do not find this offer satisfactory, we will be happy to negotiate another position more in agreement with your abilities and interests. Please do not hesitate to contact me, at your earliest convenience. Thank you.*

She went into the kitchen, and made tea. Angry dragons flared on the sides of the cup. ■

*EDITOR'S NOTE: This is a sequel to "Never Forget," which appeared in our February 1992 issue.*

# BIOLOG Jay Kay Klein

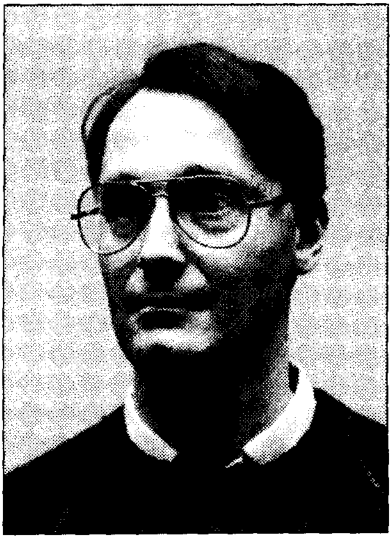
David J. Strumfels's birthplace of Levittown, PA marks him as being brought up in a post-WWII society changing even more rapidly than old-time science fiction writers foresaw. A lifelong resident of the Philadelphia area, David received a BS in Chemistry from Drexel University and an MS from the University of Pennsylvania two years later.

A childhood liking for the sciences brought regular visits to the Franklin Institute, a museum of science with working exhibits and an attached planetarium. Back then, a lecturer handled the controls manually. Now, a new, advanced projector is run by computer along with a canned narrative. At home, David had the ubiquitous accoutrements of a child's interest in science: telescope, microscope, and chemistry set.

In school he noticed that you were often required to spout back "facts" that went against your own observations, like not being allowed to draw a blue-white Sun disc but having to color it yellow. After a series of going-nowhere jobs, he decided to get some credentials by going to college about the time his high school friends had started grad school. Now working for a major chemical firm, he mostly controls instruments and analyzes data, with the aid of a computer, to work out polymer characterizations. The lab-bench people ask him to figure out just what the heck they have made, or what the devil the competition was making.

With David's turn of mind, it wasn't long after becoming a desk-bound researcher by day that he became a science-fiction reader and writer at night and weekends. The careful, precision requirements of daytime sci-

*(Continued on page 178)*



David J. Strumfels

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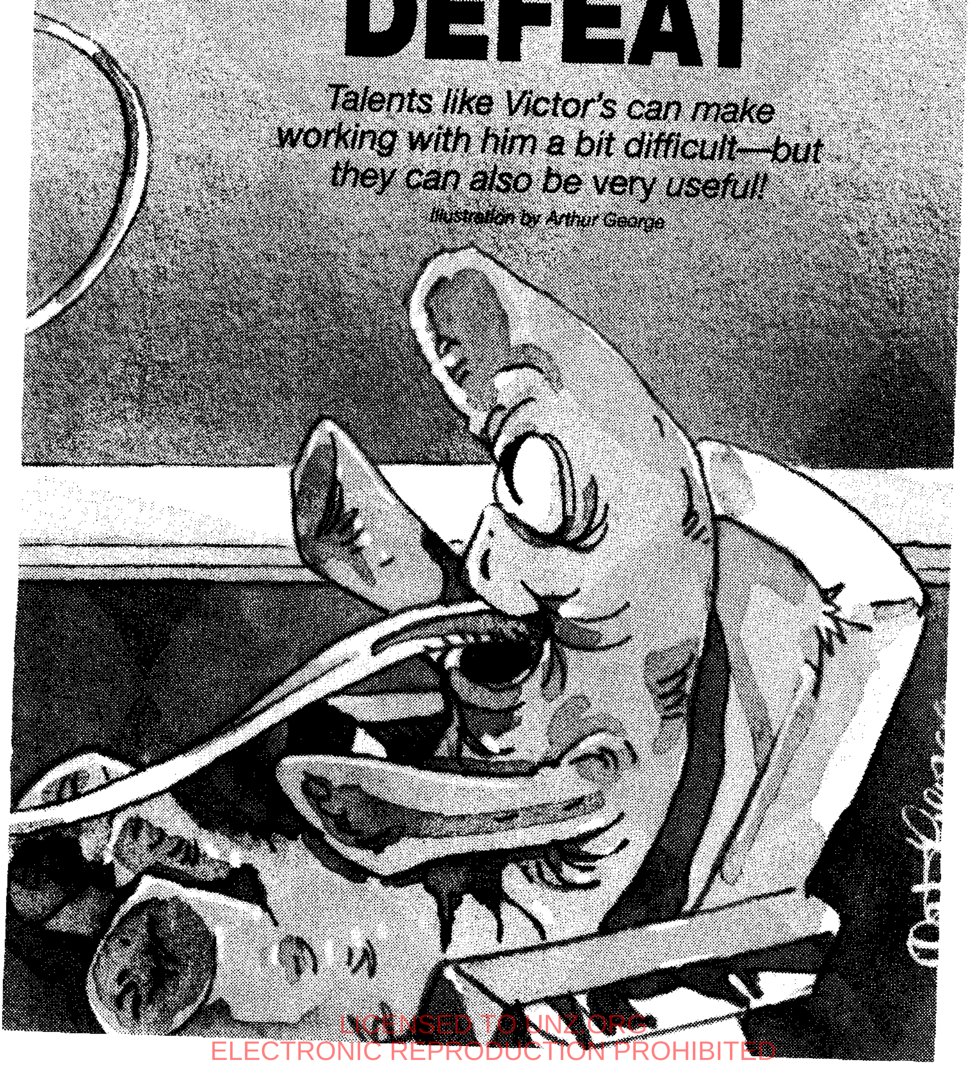
Grey Rollins

# FROM THE JAWS OF DEFEAT

*Talents like Victor's can make working with him a bit difficult—but they can also be very useful!*

*Illustration by Arthur George*



The day dawned like any other June morning, which is to say that Martin swatted the alarm when it went off, pulled the covers over his head, and was back asleep before the echoes died.

Mind you, it had nothing to do with the fact that it was June—he has the same problem during the other eleven months of the year. Martin's father was a mattress; his mother was a pillow . . . and he was clearly reluctant to leave the bosom of his family.

My thankless task was to get him out of bed in spite of himself. Unfortunately, he had grown inured to my usual methods. A fresh approach was needed.

Anything by Sousa had become a cliché. The William Tell Overture was out for the same reason. There are certain portions of Tchaikovsky's Fourth that work wonders when reproduced at maximum volume, but I needed something less lengthy than a full symphony. Wagner was capable of writing rousing brass lines into his work, but I was beginning to worry that I might permanently damage Martin's hearing if I continued blaring fortissimo trumpets into his ears.

Softly, I began. Using Mussorgsky's *Night On Bald Mountain,* I conjured a quiet village nestled in a valley. Slumbering spirits awoke, drifting through the night air to summon others from their graves. Infernal demons gathered, disjointed bones came together and danced by bonfires, the very mountain itself joining in. . . .

And Martin awoke, sitting bolt upright, eyes staring. Sweat threaded down his temple.

He stared at me, eyes wide. "Victor! You wouldn't believe the nightmare I just had! I was—"

Perhaps I was trying to look overly innocent. Perhaps he had finally learned to read my alien facial expressions. Perhaps it was the fact that I was still rendering the music, using my tympanum to recreate all the proper orchestral selections; alas, I am limited to monophonic reproduction, as I have only one set of vocal apparatus.

He scowled darkly at me, then used a corner of the sheet to mop his brow. "Victor . . ." he began, then paused to regain his composure. "I know you mean well, little buddy, but can't you just imitate the sound of an alarm clock, or something?"

"I tried that one time," I reminded him. "You tried to turn *me* off—the bruise lasted nearly three weeks."

He had the grace to look guilty. "Uh, right." He shook his head in defeat. "Maybe I ought to get a normal nine to five job where I could punch a time card like everybody else."

"The result would be the same. You would oversleep, get to work late, and be fired. Then you would have to go back to being a private detective because that's all you know how to do. Since you already *are* a private detective, why don't you pry yourself out of bed and we'll go down to the office and see if anyone needs any privates detected."

He flopped backwards on the mattress, arms spread wide. "You go without me. Call me if there's anything doing."

"As you're well aware, Martin, I can't drive a car. They don't give extraterrestrials driver's licenses. In addition to that, my legs are scarcely longer than your hands... certainly nowhere near long enough for me to reach the pedals. Besides," I added maliciously, "I'd have to steer using my tongue and the wheel would be covered with slime—"

"Say no more!" Martin cried, bounding off of the bed. "Ten minutes to shower and shave. We'll pick up doughnuts on the way in to work."

He was as good as his word, almost, and we arrived only three minutes late. Even so, we were clearly not there early enough to satisfy the man impatiently tapping his foot on the worn linoleum outside the office door bearing Martin's name. Frankly, I was amused to see someone tap his foot in real life. After all, you hear the phrase often, but never see anyone do so.

Martin mounted the stairs carrying me much the way another man might carry a briefcase to work. Since I lack a handle, he had me tucked under his right arm.

The man at the door stopped tapping, blinked and asked, "Can't Victor walk? Is he all right?"

I looked at him from my sideways perspective and replied, "I'm fine, thank you, but with legs no longer than pencils, stairs are difficult."

"Perhaps it would help if your legs weren't so fat, Victor," Martin said. "Then they would bend more easily."

*"Fat?"* I cried indignantly.

"Yeah. I think it's real cute the way you've got those little dimples where your knees are supposed to be. Reminds me of a baby's legs," Martin offered, reaching for his keys. He gently placed me on the floor, then unlocked the door, motioning our client through.

I kicked his ankle. "My legs are *supposed* to look that way, you idiot. Tomorrow I'll just let you sleep in and be late."

Martin did not give me the satisfaction of acknowledging that he had heard me. Just as well—it's unseemly to bicker in front of potential clients.

The potential client himself was dressed in a three piece suit, impeccably tailored. The suit alone was probably worth more than the archaic collection of chrome and corrosion that Martin chose to call a car. Then there were the accessories. What he had paid for the shoes would have bought a month's worth of groceries. The watch would have fed two for a year. No doubt our visitor's car was equal to the gross domestic product of a small third world country. I could practically hear the cash register in Martin's head as he tried to decide how much the traffic would bear.

Martin promptly ushered the man into his inner office. I stayed out in the front room, ready to take up my secretarial duties for the day. The man stopped just inside the door into Martin's office and gestured back towards me. "Is Victor not going to hear what I have to say?"

Sometimes I am present at the initial briefing, sometimes not. I leave it up to Martin to decide what is appropriate. Some people are uncomfortable around aliens, although I am told that, of the extraterrestrial races currently resident on Earth, I am one of the least repulsive to human eyes. Naturally, this must be taken in context—it took me the better part of twenty years to get used to the way humans look, much less become adept at telling them apart.

Actually, I was a bit surprised to hear the man ask if I was going to listen in. I had already come to the same conclusion as Martin. He had the look of one who has been pampered and sheltered. Not like the kind of person who was used to dealing with the less prosperous members of his own race, much less a member of one of the alien species.

Without comment, I waddled into Martin's office and took up a position next to the desk. Martin, for his part, gestured towards the visitors' seat, then sat behind the desk. As he sat, the springs in his dilapidated office chair gave off a horrendous metallic shriek. It sounded like nothing so much as the sound effect for a pterodactyl in a cheap science fiction movie.

Our visitor began apologetically, "I hope this doesn't disrupt your normal mode of operations. It's just that I had heard that Victor had been of material assistance in several of your other cases and I wanted to be certain that the two of you bent every effort to help me."

"It's no problem at all," Martin assured him. "Why don't you start at the top? Tell us everything."

"My name," he said, "is Sebastian Michael Grombaugh III. And I am afraid that I have been . . . shall we say, indiscrete."

"Then there's a woman involved?" Martin prompted.

Ruefully, Grombaugh nodded. "No ordinary woman, this one. Hair the color of summer sun. Eyes to put sapphires to shame. A smile to make you forget all your troubles. Unfortunately, it seems that she also has the fingers of a pickpocket, the heart of a barracuda, and the scruples of a snake."

"I take it that you had a falling out," Martin said.

"Not so much a falling out as a skipping out, so to speak. With the money, naturally."

"How much?" I asked.

Grombaugh looked distinctly pained. "Nearly nine hundred thousand."

Martin's face went carefully bland, but I could see the effort that it was costing him not to let his jaw sag. "That's quite a sum of money—grand larceny, and then some. Have you filed a report with the police?"

"I'm afraid not. You see, there's a slight complication."

"Uh, oh," I muttered, knowing what was coming.

"The young lady in question is not my wife."

It was really quite a simple case. He had married a woman who had gradually grown distant and cold. By the time Elaine Hinds had popped onto the scene, he was ripe for the plucking. She apparently had wasted little time reaching for the fruit.

In a matter of weeks she had a full set of keys. One to the Ferrari, one to the house, and one to a guest house that stood away from the main house. It seemed that they had met there often.

Grombaugh had made his crucial mistake when he told her the combination to the safe in his study. Like the keys, he had given it to her willingly. In retrospect, he wished he had bitten off his tongue instead.

It was not unusual for the safe to contain as much as five or ten thousand dollars, but, by coincidence, Elaine had timed things such that the proceeds from the sale of a piece of real estate were on hand. Not so coincidentally, Grombaugh had told her about it, in the usual way that human men try to impress women by mentioning large sums of money. Shortly thereafter, Elaine, the Ferrari, and the cash were all missing.

Grombaugh had covered the loss of the car by telling his wife that the cylinder head was cracked, and that it might be some time before it was repaired, as certain other necessary parts had to be ordered from Italy. The money, however, was a different matter. His wife, who went by the improbable nickname of Bird, knew that it was there. In fact, they had planned to use it to buy a house on the coast of Maine as a summer getaway. Considering that they had already made an offer on an attractive cottage, its loss was likely to be noticed sooner rather than later.

The police, of course, were out of the question. They would undoubtedly do something gauche, like mention his lover to his wife, which would complicate his life beyond all hope of recovery. That meant that Grombaugh had few options, and little time in which to exercise them. Our job was to locate Elaine of the summer hair and sapphire eyes. Presumably the Ferrari and whatever portion of the money remained would be nearby.

The trick, of course, would be to find her. Unsurprisingly, she had left no forwarding address, and, with that much cash on hand, was unlikely to be using a charge card to put fuel in the Ferrari.

We were able to get a few potentially useful bits of information out of Grombaugh, such as the fact that Elaine had mentioned a mother in New Orleans. The main problem was that the usual ways of tracking a person take time, and that was in short supply.

As soon as Grombaugh left, we got to work. I began finessing the telephone company out of copies of Elaine's last three phone bills while Martin called the owner of the house she had been renting. He was pretending to be an agent of a moving company who needed to see her possessions before giving an estimate as to how much it would cost to move them to Chicago.

The phone bill copies would arrive by mail; there was nothing we could do to speed that process. However, Martin obtained permission to enter the house where she had been living.

Martin shook his head, looking worried. "Victor, I've got a feeling that we've lost her. With that much money and a silver Ferrari, she's probably halfway across the country by now. Los Angeles or Miami . . . somewhere where there are dozens of high class sports cars and loads of pretty blondes with money."

"Oh, we'll find her all right. It's just that we may not have time to do so before Bird figures out that something is amiss."

"The most efficient thing to do would be to bring in the police. They could issue an alert for the Ferrari. That kind of car sticks out like a sore thumb. Unfortunately, that's the one thing we can't do." He glanced at his watch. "Let's get a move on. There's just enough time to get over to Elaine's house for our appointment."

As Martin was strapping me into the front seat of the car with the seat belt, I said, "By the way, it's been a couple of days since I've eaten. Do you think we could stop by the dump on the way home tonight?"

Martin shuddered. "What's this *we* stuff, dumpster breath? Just because you think a half-rotted head of lettuce is a delicacy doesn't mean that *I* intend to eat garbage with you. I prefer my food fresh."

"But it might . . . *bleed* on you!" I croaked, my imagination reeling at the very concept.

Just as Martin has trouble with my dietary requirements, his cause my mind to derail. The idea of eating anything without a nice, healthy coating of slime is anathematic. Humans are on the right track with the idea of aged beef—they just don't take it far enough.

Martin got in on the driver's side and inserted the key, then looked my way. "Victor, I like you a lot, but I don't think we'll ever eat from the same plate."

"You can say that again," I muttered.

As we neared the house where Elaine Hinds had lived, the lawns got larger and greener. Weeds were fewer. Other, more subtle clues to wealth presented themselves to the trained eye. For instance, what few childrens' toys were to be seen weren't made of that cheap, hollow plastic that fades in the sun the first year and wears out entirely the second; more substantial steel toys took their place.

Martin slowed, squinting at the house numbers, then finally stopped. "Looks like this is the one."

The house was smaller than most on the block, but just as tidy. There was a car in the driveway with a man leaning against the fender. As soon as he saw us pull to the curb, he began walking towards us.

Martin came around to my side of the car and began to unwind the seat belt, which he had looped loosely around my body. Were we ever to be in a serious wreck, it would more likely strangle me than save my life, but it does help me stay erect when Martin attempts to make the car corner on two wheels.

"That tickles," I hissed.

Martin eyed me. "Do you want to stay in the car?"

"What? And let you miss all the important details?"

"Then stand still. They didn't design this belt to hold aliens with no laps."

"I *can't* sit, as you well know. My body doesn't bend that way."

Martin lifted me from the seat and placed me on the ground just as Elaine's landlord walked up. "You from the moving company?"

"That's correct," I said firmly before Martin could open his mouth. "This is the head of my work crew. We're here to look over the contents of the house. See how many rooms' worth there are, and so forth." I began to stomp purposefully across the yard towards the front door, ignoring the horrified look that Martin was giving me.

Not hearing footsteps behind me, I turned. My arms are only wizened approximations of human arms, but I put them about where my hips would be, if I had any. "Well? I haven't got all day, you know. Let's get this over with." I considered tapping my foot, but decided that it would be a little too much.

The landlord looked at Martin's rusty derelict from a junkyard, then at Martin, then at me. Clearly we were having a credibility crisis. "For heaven's sake, my car's in the shop, so I had Martin drive us here in his. I know it's an eyesore, but at least it runs." I turned my one eye on Martin and tried to give him a contemptuous look. "And before you start in on me about wanting a raise so you can buy a better car, you'd just better think again. Next time I'll get Harry to drive me and I'll send *you* to clean out the warehouse." I turned back to the landlord and made a snorting noise, as though to say that you just couldn't get good help these days.

This time when I turned and started towards the house, they fell in line, like baby ducks behind their mother. Having established my authority in such an over-the-top manner, I would be expected to remain in character. I relished the thought.

As the landlord unlocked the door, he ventured to ask, "The lady isn't planning on breaking her lease, is she?"

"I wouldn't know," I snapped. "When does her lease expire?"

"Two more months. It was a six month lease."

"I don't think there'll be a problem, then. She's talking about moving to Baltimore in late August or early September."

After that, he was silent. Human psychology being what it is, he followed Martin from room to room to make certain that he didn't steal anything. After all, it's always the underlings who have sticky fingers—never the boss.

While Martin led him as far away as possible, I quickly rummaged through desk drawers and closets. I looked under the refrigerator and behind the sofa. I thudded down the hallway. "Let's go. I've seen enough to fix up the estimate."

He nodded.

As we were preparing to go out the door, the landlord asked, "Uh, do you have a card? We ought to leave something so that she'll know you've been here."

I snorted again. "I don't carry cards because I don't have pockets. People don't usually have trouble remembering me—I don't look like any other mover in town. Thanks for letting us in. Tell Miss Hinds we'll be in touch."

With that, I stalked back out into the grass, Martin hurrying to catch up. As he lifted me into the car, he gave me a very strange look indeed, part anger, part confusion.

As we pulled away from the curb, he started in on me, "Victor, don't you *ever* pull a setup out from under me that way again! If I had—"

"Martin, shut up," I said quietly.

He shut up.

"What would you have done when he asked *you* for a business card? Given him some lame excuse about having given out your last one an hour ago? How did you expect to explain me? As your accountant? Hardly. A mover? Even worse. Clearly I have more brains than muscle—"

"That's not saying much," Martin muttered under his breath as he negotiated a turn.

"—So my only possible role would be as the boss."

"But what if he had recognized you?"

"In a manner of speaking, I'm sure he did."

*"What?"*

"He's probably seen my picture in the paper from time to time, but it's a truism that all aliens look alike. He probably just assumed that I'm a different one from the one he's seen in the paper. You were safe because they never run your picture. Who wants to see a picture of a human when they can have a picture of an alien, instead?"

Martin grumbled and growled, snarled and snorted. "All right, all right, but *warn* me before you do that again, OK?"

"I didn't know until I saw him that he was the business card type. After that, it was just a question of improvising."

He sighed. "Victor, you'll be the death of me."

"Don't die yet. You have to take me by the dump first."

"So what did you discover while I was leading him on a wild goose chase through the house?"

"Nothing."

*"What!"*

"Believe it. Nothing. No receipts in the drawers, no unpaid bills on the kitchen counter. Nothing. The furniture was rented, just like the house. She took one suitcase full of essentials and left everything else behind. No question about it, the bird has flown the coop."

"Bird's the other one—his wife," Martin pointed out.

I ignored him. "The conclusion is obvious. Elaine, if that's really her name, which I am beginning to doubt, is a pro."

"Pro?"

"A beautiful woman with no visible means of support comes out of nowhere, gloms on to a lonely rich man, gets friendly, gets the goods, gets out of town."

Martin nodded as he saw my point. "And at this very moment, somewhere in Palm Springs, a beautiful blonde in a silver Ferrari is renting a place to live while she seeks out another victim."

"Precisely."

He grimaced. "That is one cold woman." He glanced over at me. "Any ideas as to where to go from here?"

"We could go through her trash on the off chance that there might be something useful in there."

*"Ugh!"* he grunted. "I *hate* going through peoples' trash."

"I volunteer."

"You would," Martin growled, as he turned the car around.

Needless to say, there was nothing useful in the trash, either. The can was as empty as the house. Clearly, she had left quickly, but not in haste; all according to a predetermined plan. Elaine Hinds was nothing if not thorough. I was beginning to doubt that the duplicate phone bills would give us anything we could use. She was not the type to leave us access to a telling long distance charge. I grudgingly raised my estimation of her another notch.

While we were out and about, Martin swung by the city dump and dropped me off, saying he had an errand to run. Actually, I suspect that he simply doesn't want to be seen in the presence of an extraterrestrial who licks out the insides of discarded cans of sauerkraut.

He was back in half an hour, as promised, but as I approached the door to the car he began shaking his head. "Oh, no, you don't. You're greasy, smelly, and sticky from head to toe. You're riding home in the trunk. Then I'm going to rinse you off with a hose before you go inside. You smell *awful!"*

"Probably the oranges," I mused aloud. "A whole crate of moldy oranges. Oh, and the fish heads! That was the best part—"

Martin turned a pasty color. "Uh, Victor, could we change the topic? I'm not really all that interested in what you ate out there, you know."

"But you tell me about what you eat—for that matter, I even *watch* you eat."

"That's different," he grumbled, as he unlocked the trunk. "I eat *real* food, not leftovers."

"Just think of me as part of the recycling effort," I told him.

"I'd rather not," he replied, as he lifted me into the trunk, wearing the rubber gloves that he kept in the car. "To me, being green means helping the environment, not trying to keep from throwing up."

Sure enough, he sprayed me down with the hose when we got home. Some would see a shower in the yard as insulting—not me. Happily, I turned to and fro, making sure that all parts of my skin got wet. Water is one of the most sensuous pleasures available anywhere in the known Universe, and I made the most of it. Aside from the purely physical pleasure, it evoked fond memories of rainstorms back on my home world.

Since we had been out of the office all afternoon, Martin called and tapped in the code that caused the recording machine to regurgitate its accumulation of messages. Grombaugh had called, wanting to know if we had made any progress tracking down Elaine.

Martin turned to me after hanging up the phone. He looked troubled. "Victor, I'm not sure we're going to be able to find Elaine in time to save Grombaugh." He slumped into a chair. "I absolutely *hate* losing, but . . ." He shook his head in resignation.

Martin, depressed, is of no use to anyone, especially himself. Left to his own devices, he will sink into a swamp of despair. His mind ceases to function, leaving me in charge by default. My mind is fully capable of handling any deductive work that should fall my way, but my diminutive size and relative lack of strength tend to hamper my investigative efforts. In short, I need Martin in top form, if for no other reason than to do the sweat work. Of course, to give him his due, he does comes up with the occasional clever idea.

What I needed was to get him stirring. Inaction would create a self-fulfilling prophecy. Unfortunately, I was not able to think of anything that would spark his inner fires, and he spent the evening moping.

The next morning was a contest of wills. Getting Martin out of bed was only the first of many hurdles. He moved at a glacial pace, often stopping entirely for minutes at a time, staring vacantly into space.

When he entered this near-comatose state in the shower, I played a dirty trick on him. I reached inside with my tongue, which, being as long as Martin's arm, was ideal for the purpose, and turned off the hot water. His shriek was instantaneous. Frantically, he grabbed for the knob. When his hand contacted my tongue, he let out a howl of anguish and bolted from the shower, shivering. He then proceeded to threaten me with dire consequences if I ever so much as *thought* of doing such a thing again.

Getting him dressed was a comparative improvement, although he kept a wary eye on me the whole time. Breakfast was the easiest of all—we simply skipped that part. I think he was afraid of what I might do to his food if he didn't eat quickly enough.

The first indication of life I saw in Martin occurred as we were turning into our parking space at the office. There was a stunning redhead with green eyes just getting out of a small Ford as Martin parked his car. His eyes automatically fastened on her . . . unfortunately neglecting the concrete stop in front of us. The car hit the stop, canted sharply upwards, then slammed back down as the wheels dropped over the other side. The shock absorbers were unequal to the task; the car bounced violently.

"Excellent way to make a good first impression on a woman," I noted calmly.

Martin delivered me a withering glare. "Listen, torpedo-head, next time you want to drive, just say so." He shifted the car into reverse and was about to try to undo the damage when the redhead appeared at his window. "Goodness, are you all right?"

"Just testing the suspension," Martin answered breezily. "It's been squeaking a bit, and I wanted to see if I could get it to do it again."

"I wish I had known about that trick a month ago. My car was making a funny noise, but I couldn't make it do so when I took it to the dealership."

Martin looked faintly embarrassed. "Um, actually, I wouldn't try that on any of the newer cars. They don't have enough ground clearance."

She nodded in understanding. "I see. Listen, could you tell me which of these buildings Martin Crofts works in?"

He abandoned his efforts to get the car back across the stop. "I'm Martin Crofts."

She leaned down further to look across at me, practically inviting Martin to stare down the top of her blouse. "Then you must be Victor," she said.

"I am," I answered gravely.

If I expected a reply, I was destined to wait in vain. She and Martin were staring raptly into one another's eyes from six inches distance.

I think I neglected to mention that Martin has this unholy effect on women. Something to do with the fact that he is slightly over six feet tall, athletically built, with black hair and intense green eyes. He is a north magnetic monopole, and all women are south.

Unfortunately, by definition, the attraction is mutual.

"Um, folks, can we go on inside?" I asked, after giving them sufficient time to plumb the depths of each other's souls.

"Oh . . . sure," Martin answered, stepping out of the car.

I let them get a good ten feet before I called out, "Forgetting something, Martin?"

He stopped dead in his tracks, then scurried back and unwound me from the seat belt, apologizing profusely. "I don't know what I was thinking, little buddy—"

"I know precisely what you were thinking, and the way you were staring, chances are that she does, too."

That earned me a dirty look.

"She's waiting for you," I observed blandly.

His eyes widened. "Oh, yeah." He unceremoniously dumped me on the asphalt and hurried back to her, leaving me to close the car door myself. Having had trouble getting the door to close in the past, I hit it with everything I had.

Naturally, it swung noiselessly shut without even a hint of resistance, and I fell flat on my face in the parking lot. Martin must have oiled the hinges without telling me.

After sorting through various affronts to my bodily health and dignity, I pushed myself to my feet and went galloping after Martin and the drop-dead redhead. Fortunately, they were too busy getting acquainted to have noticed my momentary loss of equilibrium.

Martin did remember his manners long enough to carry me to the top of the stairs, but, once at the top, I was left to fend for myself. By the time I waddled into the office, they had sequestered themselves in Martin's inner office, and the door was firmly closed.

No problem. There was enough to do out front to keep me occupied for a while. If all else failed, I could read a book. Reading is one of the best ideas humans have come up with; no other species has anything that even remotely compares.

It was just past noon when they came back out of Martin's office. As they passed, Martin informed me that they were going out for lunch.

"Ah, Martin, we have a case pending," I reminded him.

I might as well have saved my breath. The door had already closed behind them.

I fully expected Martin to take a two-hour lunch. I was wrong. It was only an hour and a half—but he brought her back with him and they sealed themselves in his office again.

I passed the time by working my way through the few remaining leads we had pertaining to Elaine. I tried to find the mother in New Orleans, but failed. Either her mother's last name wasn't Hinds, or, more likely, there simply wasn't a mother anywhere in the state of Louisiana.

Dead ends multiplied like dead flies on the window sill. Some petered out immediately, others lay there twitching feebly for a bit before expiring.

Several times I was tempted to interrupt Martin, but there really wasn't anything he could do about the situation. Barring a call from Grombaugh to tell us that he had remembered something new, we were rapidly reaching the end of what we could do for him.

Just on the off chance that Bird, by some unforeseen circumstance, did not find out about the missing money within the next few days, I started a few new lines of inquiry. I didn't expect them to bear fruit, at least not in time, but it was worth a try.

At a quarter till five, Martin and the redhead came out of his office. His eyes were shining. He escorted her to the door, then stood there watching her walk down the corridor.

After she was out of sight, he turned to me and sighed, "God, did you see those *legs?*"

I affected a snort of derision. "I don't recall that you gave me the opportunity to see much of her at all."

He leaned against the door frame, smiling dreamily. "I'm taking her out to dinner tonight."

"I'm overjoyed," I said sarcastically. "I don't suppose that you remember that we have a case, Martin. One with severe time constraints. By any chance, did the young lady with the red hair happen to bring us a paying case? Because if she didn't, you're going to have trouble meeting your rent, since we haven't been able to produce Elaine for Grombaugh."

He looked down at the floor. "I'm sorry, Victor." He sighed. "No, she's not a paying customer, but at least we'll get some free publicity out of this. Her name is Nancy Gillis and she's interviewing for a magazine called *Curious Casebook.* We're going to be featured in the next issue. It seems that our partnership is quite unusual—"

"So you've finally decided to admit that I'm a full partner instead of a short, leathery, monocular secretary?"

"—And she's going to give full coverage to your contributions. After all, alien detectives aren't found on every street corner."

"So how long will this interview process take? Grombaugh needs answers posthaste."

He shrugged. "It shouldn't be too much longer, Victor. We're going to talk some more over dinner. That should get us somewhere."

*"Hunh!* Somehow, I have a feeling that where it will get you has more to do with sheets than table cloths."

Martin looked shocked. *"Victor!"*

"At the rate things are going, I'm going to end up running this case by myself." I was hitting below the belt, I confess, but since that seemed to be where the majority of his thinking was taking place, it seemed the best way to get his attention.

His face took on a grim expression. "All right. I promise you that I'll be back on top of things tomorrow."

"At the rate you're going, you'll be on top tonight," I retorted sharply.

Actually, I wasn't as angry as I sounded. Once Martin decides that something is a matter of honor, then the deed is as good as done. It was simply a matter of keeping him from getting into a habit of ignoring things.

Martin acted properly chastened on the way home that afternoon, so I let him off the hook, even going so far as to tell him a ribald joke I had chanced to overhear. It was in my, and Grombaugh's, best interest that Martin get his wild oats sown as quickly as possible so he could then turn his undivided attention back to the case at hand.

When we got to the apartment, I immediately made myself as inconspicuous as possible by picking up a book I had been reading. Martin went about the arcane rituals that men practice when they are trying to make themselves attractive to the opposite sex. I could have told him that it was unnecessary effort—that the situation was analogous to shooting fish in a barrel—but why spoil the fun? If Nancy Gillis wanted to be chased, then, by all means, chase away.

I had read three chapters by the time the doorbell rang. I didn't bother answering it, which was wise as Martin pelted towards the door at a dead run. Had I been in his way, I would have been trampled.

He pulled himself up short, composed his face, and opened the door calmly, just as though beautiful redheads were on the other side every time he opened it.

"Hi, Nancy," he said, ever the master of witty opening lines.

"Ready to go?" she asked.

He nodded and they were off without even a backwards glance. I went back to my book, settling in for a quiet evening.

Shortly after twelve-thirty, they returned. Clearly the fish had been shot, as they stopped in the doorway for a long, lingering kiss, complete with roaming hands and sound effects. Just as I began to fear anoxia, they came up for air, smiled brightly at me, and disappeared into the bedroom, trailing an aura of pheromones.

In their haste, they had forgotten

to close the front door. I padded over and pushed it closed, noting idly that the front bumper on Nancy's car sported a sticker from a local rental agency.

By one o'clock, I had finished my book. That was when I discovered that I had carelessly allowed my reading pile to dwindle away to nothing. I now had nothing to help me while away the night hours.

Humans, for some reason, sleep. I have never understood this, as it seems to me to be a tragic waste of time. However, there is nothing to be done about it, so I spend the time while Martin is unconscious reading. It has tremendously increased my understanding of the human race, as well as teaching me a great deal about the physical sciences, something I had known little about before coming to Earth.

Over the years, I have covered many topics, going into some only lightly, others in depth. Oddly, I had never taken time to read up on the detective industry. A case of being too close to the trees to see the forest.

Considering the hour it was too late to go to the library, but I could at least consult the card catalog, as all the local libraries maintain that information on computers that are available via modem around the clock.

Martin's computer, like his car, was a relic of better days. In fact, like me, it had belonged to his late uncle, so it was anything but a state of the art machine. However, it had a modem, and, for the moment, that was enough.

I began searching for books by topic, noting the ones that looked most interesting. I then let my curiosity travel where it would. I soon had more titles than I could read in a month, and was about to log off the system when it occurred to me to see if the library carried issues of *Curious Casebook.* They did not.

This didn't surprise me, since the city library has always been comparatively weak on periodicals. Just for fun, I dialed into the county library, but with the same result. The state library, while less convenient to get to, could be counted upon to have most things, but, again, I drew a blank.

The usual way to access the card catalog of the state library yields only information on what they actually have, but it is possible to access the data in a different way, which lists the title of every item in print, whether the library has it or not. This is done so that interlibrary loans may be arranged. When this avenue produced no results, I began to get very curious, indeed. Time to *think* things through.

It did not take long.

I made a fast phone call, then, as quietly as I could, I slipped back into the living room and stood near the front door. Concentrating deeply, I recreated the sound of fast footsteps approaching.

Loudly, I simulated a fist pounding on the door. I even threw in the sound of the loose security chain rattling against the door panels as it vibrated.

"Open up, Martin! Let me in!" I bellowed, taking pains to produce a precise imitation of an angry human male voice.

Imitating the sound of someone kicking the door hurt my tympanum, but it was in character and would help create the atmosphere I wanted.

"I know she's in there!" I shouted at the top of my lung, not neglecting to add the muffling tonal distortions of someone speaking through an inch and a half of wood.

Then an amazing thing happened. The door to Martin's bedroom was flung open, and Nancy bounded out, stark naked. She glanced frantically around the room, her expression like that of a cornered animal. She froze when she saw me.

"There she is!" I shouted, still as though through the door.

The frozen glare of hatred she gave me was sufficient to make me fear for my life. Fortunately, at that moment, Martin came up behind her.

*"Victor?"* Martin demanded in confusion. "I thought I heard Grombaugh at the door. Was that *you?"*

"Yes, me! I was imitating Grombaugh's voice!" I shouted, adding imitation pounding on the door for emphasis.

He stared at me as though I had lost my mind. "What the hell has gotten into you?"

I reverted to my normal voice and bowed as best as I was able, given the limitations of my body. "Martin, please allow me to introduce you to Elaine Hinds, also known as Nancy Gillis, and who knows how many other names." To her, I added, "Say hello, Elaine."

"I don't know what you're talking about," she said frostily.

Martin stared hard at her, but the expression on his face was quite unlike the looks he had been giving her earlier in the day. "Elaine?"

"My name is not Elaine—" she began.

"Just as it's not Nancy, I'm sure," I put in.

Her green eyes sparked, and she spun on her heel and stalked back into the bedroom. Without a word, she began to don her discarded items of clothing.

Martin walked half as far and was reaching out towards her when he stopped and looked back at me. "All right, Victor. Let's have it. And it damn well better be good, or you're in a world of trouble."

"To begin with, there's no such publication as *Curious Casebook.* It's a name she made up, probably on the spur of the moment. She wanted an excuse to get close to you so she could quiz you about current cases. Hers, in particular. That way she would know how much danger she was in."

"But Elaine had blonde hair," Martin protested. "And the Ferrari."

"The red hair was just a red herring. She could just as easily have been a brunette, the bottles are on the same shelf at the drug store," I pointed out. "Either the green eyes are contacts, or the blue ones were. Perhaps both, for all I know. The Ford is a rental car. It's a great deal less conspicuous than a Ferrari."

Elaine, or Nancy, or whatever her name was, was ignoring us. Moving efficiently, she pulled on her blouse, buttoned it, and reached for the various items of jewelry on the nightstand.

"But why stay in town? Why come after me?" Martin cried.

"Call it Tom Sawyer watching his own funeral. Call it a thrill seeker wanting the adrenaline rush of taunting fate. Call it a pro wanting to keep tabs on the progress of the search for herself. My guess is that she was in the process of setting up a new persona, and decided that, as long as she was in the area, she might as well see how close you were getting."

Martin frowned. "But why set up an alias here? Isn't that dangerous?"

"Certainly, but it does have a few points going for it. One is that this is the *last* place anyone would think to look for her. After all, everyone immediately assumed that she had hit the road—not once did we even consider that she might be under our very noses. Another benefit of staying here is that if someone wants a previous address, she can give one that will actually check out, should anyone bother to call."

Martin rubbed his temples wearily. "Nancy, do you have anything to say?" Poor Martin was torn. On one hand, he didn't want to be wrong; didn't want to have been played for a fool. On the other hand, he was beginning to see the logic behind what I was saying.

She carefully applied fresh lipstick, checked her hair in a mirror, and turned to face us. "Really, there's nothing to say. I've been tried and convicted by that," here she gestured disdainfully at me, "one-eyed kangaroo court from some hellhole planet." She swept past Martin, but paused at the bedroom door, smiled provocatively back at him and said, "Besides... you can't *prove* a thing."

She began walking rapidly towards the front door, heels clicking briskly. Unable to resist the parting gesture, she paused with her hand on the knob and said, "It's been nice knowing you, Martin—you're actually kind of sweet. I wish I could say the same for your pet fire hydrant."

She opened the door, turned ... and ran face first into the broad chest of Sebastian Michael Grombaugh III.

He looked down at the improbably perfect lip prints on his immaculately tailored shirt, then back at her and raised an eyebrow sardonically. "Going somewhere, Elaine?"

Late the next afternoon, Grombaugh dropped by the office, smiling broadly, if a bit wistfully. "Good afternoon, Victor. I hope you're doing well."

"Quite well. And you?" I responded formally.

The sad smile he gave me spoke volumes. "To be frank with you, I rather wish that things had turned out differently. I really was quite taken with her, you know."

Martin appeared in his office door.

"Ah, there you are," Grombaugh said. "I thought I would drop by and pay my bill in person. It would be difficult to explain to Bird if it were to come to the house."

"So the Ferrari was where she said it was?" Martin asked.

Grombaugh nodded. "In a rental garage across town, yes. And the vast majority of the money was in the trunk, just as she claimed. She had spent a few thousand, but I can make up that much without trouble. As of this moment, it is safely back in the safe, so to speak."

"You remembered to change the combination?" I asked.

"The first thing I did," he assured me. "All the locks have been rekeyed, too. I told Bird that I had heard something about thieves." Again, he smiled ruefully. "Rather closer to the truth than I care to admit."

"What did you do with Elaine after you retrieved the car and the money?" Martin asked.

"Turned her loose, unfortunately. There wasn't much else I could do without bringing the law into the picture."

"So she's free to do it again."

"Yes, I'm afraid so. However, I'm confident that some day she'll meet her match. For the moment, I'm content to have come that close to the fire without being burned—at least not seriously, anyway. It was a learning experience, and for that I should be grateful, I suppose."

He slipped his hand inside his jacket and brought out an envelope, which he gave to Martin. "There's your fee, as we discussed. I would like to express my gratitude for the prompt and professional job that you did on this matter." He reached back into his jacket and brought out another envelope, which he placed in Martin's other hand. "This is a little bonus, for which I would like to ask a favor."

Martin, eyes wide, said, "Of course."

"Due to the delicate nature of the situation, should Bird ever find out that I was acquainted with Miss Hinds, I would appreciate it if you would assure her that I met Elaine through you—that Elaine was your, er, friend, rather than mine."

Martin, blushing furiously, nodded, clearly not trusting himself to speak.

"We'll be more than happy to do so," I told Grombaugh.

"Good. I've followed you two for quite some time and, as Bird will attest, I am sometimes given to prattling on about your exploits. I'm just lucky that she never found out that anything was amiss, as she would have known who I would turn to. Shortly thereafter she would have been asking embarrassing questions. Still might, should I have unwisely left any loose ends. For that reason, I thought that it would be wise to arrange our stories ahead of time."

"If Bird should get in touch, we'll simply explain that you wanted to meet Victor in person and that Elaine chanced to be there at the time," Martin said.

"And never let on that the meeting was at your apartment in the wee hours of the night, following a call from Victor," Grombaugh said, winking. "I think that will do admirably." He smiled again and turned towards the door. "I'll be going now. I wish you both well."

And with that, he was gone.

I looked at Martin. "Well, that clears up my one remaining question."

"And that was?" he prompted.

"How Elaine knew to come after you, as opposed to any other detective in town. Clearly, Grombaugh must have talked about us to her, the same way he does to Bird."

"And I thought it was my good looks," he said dejectedly.

"Just be glad that you didn't have anything worth taking. If she had done the same job on you that she did on Grombaugh, it would have set you back ten years just to buy another car."

"I suppose you want me to thank you for saving me from her," he groused.

"It was a near thing," I agreed, rubbing it in. "Realistically speaking, we were dead in the water as far as tracking her. That would have cost us Grombaugh's case. And there you were, about to become the barracuda's next meal."

"I was *not,*" he said hotly.

"Well, considering that you're a financial lightweight compared to Grombaugh, she probably thought of you more as an after-dinner mint."

He held up his hands in defeat. "All right, all right. I admit it. You snatched victory from the jaws of defeat."

"Victor *always* snatches victory from the jaws of defeat," I said smugly. ■

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*(Biolog continued from page 158)*

ence are balanced by an after-hours release of free-wheeling imagination.

Chemistry is called the "central science," since it requires knowledge of physics and leads into all the other disciplines. These come into play in David's writing, which he feels also is enriched by the various experiences he's had along the way. Would-be writers may find it interesting that he only started selling his stories after he switched to a word processor. His first was in the June, 1990 *Analog,* an event worth more to him than all the academic awards garnered in college. A wish-fulfillment dream of the acceptance of "Breakdown" occurred several days before Dr. Schmidt's letter actually arrived.

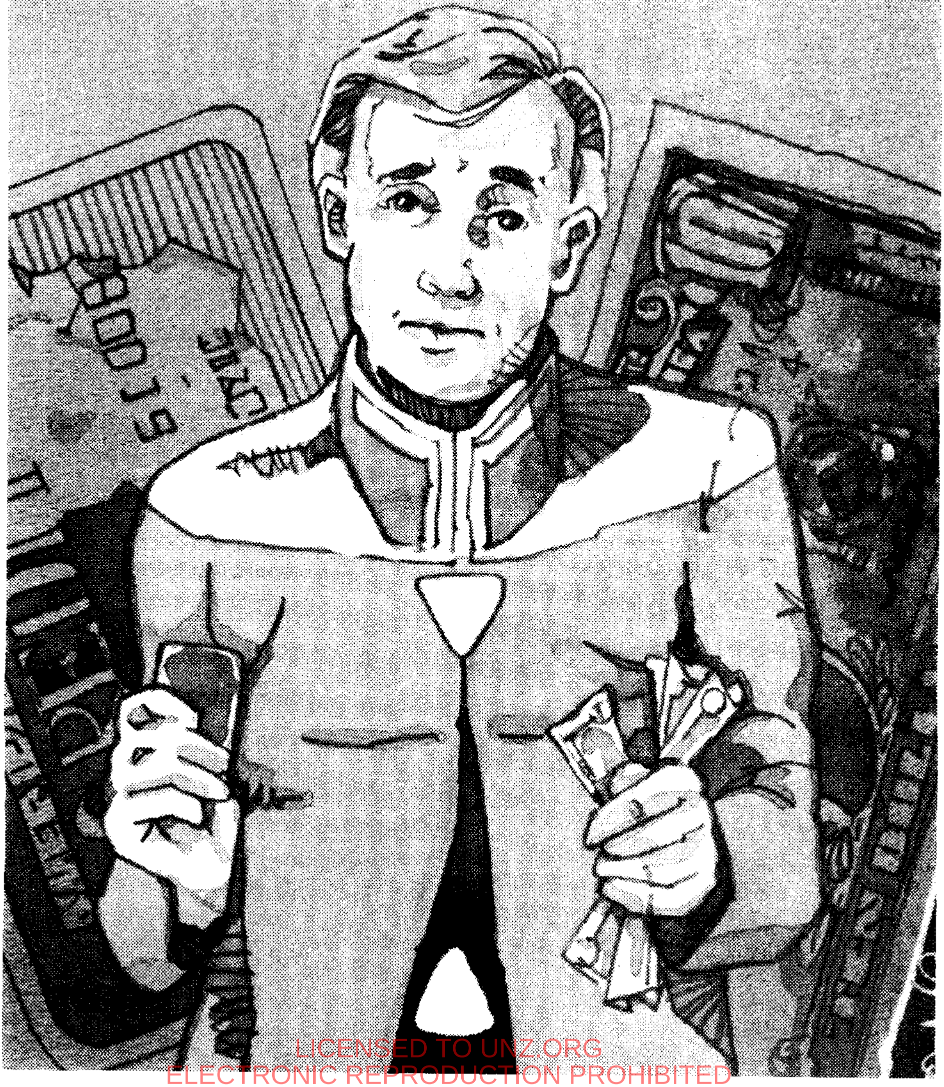
David likes to peer ahead into the near-future; his writing is concerned with the likely effects of science and technology during his own lifetime. We are just on the edge now between the short, nasty lives of our past and the long, rich lives seen ahead in our future. Still, he cautions, the future doesn't come with guarantees and we could wind up in the same dust that buried Assyria, Egypt, and Rome —and dinosaurs. ■

### Mark Rich

# THE REAL THING

### *When were the Good Old Days?*

*Illustration by Arthur George*



"I'm sorry," the clerk said. She kept one hand on the till and the other on the box of detergent. She looked with doubt at the money in his hands. "I don't think we take that stuff."

"What do you mean, you don't think you take this stuff?" Max said. "This is money. What's wrong with money?"

"Like I said, I don't think we take that."

"Oh, come on," said Max. "Listen, I came here to buy this, and I happen to have cash on hand. *Everyone* knows what cash is, right? See? This is just a little more than the amount of the total—I've got six dollars here, and you'll give me fifteen cents change." He felt like he was explaining to a chimpanzee how to eat bananas.

She beckoned to a tall man who appeared instantly at Max's side, hands resting in the pockets of his green apron. The name of the store shined in self-lit white across his front: *Lucky Power Save! Groceries! Lickety-Quick Service! Instant Checks & Credit Cards!*

"Mr. Green," the clerk said, "we don't take this stuff, do we? What if it's fake?"

"Well, well," said Mr. Green, taking the cash from Max's hand with spidery fingers. "This *is* a little unusual, isn't it?" He held the bills close to his eyes and examined both sides. "Well. Go ahead and take these, Julie. Just be sure to get his credit card and driver's license, and put the numbers on the back of the bills. And initial them."

"Thanks, Mr. Green."

Mr. Green arched one eyebrow at Max before marching off to another part of his emporium. Julie looked at Max expectantly.

"You mean you won't just take them?" Max said. "This is *money*, for goodness' sake!"

"Well, it might be money," Julie said, screwing up her lips, "but we've got to have a credit card number. You have a credit card?"

"No."

"Well, then, what about your driver's license? I suppose if we just had that number—"

"I walked here today. I don't have my driver's license. You want my mother's phone number? I can give you that!"

"Now, now, I'm just trying to be reasonable. We don't need anyone's phone number."

"You're trying to be reasonable? I'm trying to buy detergent so I can do laundry. Isn't it your job to sell me some? I have a date tonight! Will you please take this perfectly good-as-gold, cold cash from me? It's *money*. You know what *money* is, don't you?"

"I'm sorry, but if you don't have a credit card or driver's license, we won't be able to take your cash."

"Wha—"

She whisked away the box of detergent and chucked it into a basket at her side. She pushed the bills back at him.

"Sir? We have people waiting in line to check out. If you don't mind—"

"I *do* mind. How about I get one of your instant credit cards?"

She darkened. "You don't *have* a credit card. How do you expect to get one if you don't *have* one already?"

"Hey," he said. "I can take a hint!" He snapped up his money and stormed toward the door.

"Have a nice day," Mr. Green said, waving.

Max restrained himself from giving Mr. Green the finger, and tried to stomp hard enough across the automatic door-opener to give it tremors.

Flora's Flor-All, located a few doors down on the mini-mall, looked a little dismal inside. Max wondered why the clerks had arranged the flowers haphazardly in the coolers, as if they didn't care how they appeared.

He walked up to the desk. A young clerk was busily wrapping some carnations. She whistled to herself as she worked.

"Excuse me," Max said. "I'd like to have some flowers delivered."

"Delivered? OK," the clerk said, taping up the wrapping paper. "But you can't place the order here."

"Oh? Where do I go?"

"Anywhere," she said, shrugging. "Just not in person. We don't take orders in person. Just by phone or E-mail."

"Ah, you're kidding," Max said, leaning forward on the counter and grinning at her. She looked cute, with swinging hair and a polka-dot blouse. She was joshing him because she liked his face. "Here I am—I was nearby doing other errands—and since I'm here, it'd be a whole lot easier if I just placed an order now. I mean, you don't expect me to—"

"And how would we confirm it? You're *here*, so how could we electronically confirm your order? We have to confirm everything! How do we know this isn't just a prank?"

"How about we just forget the confirmation? It's just busy-work for you anyway. I'd like to have a bouquet of—"

The girl put down the bundle she was working on and thumped one fist on the table. "Hey, listen, mister, customers have been giving me grief all morning and you're going to give me more? We have a store policy. Like I said. No orders in person. Telephone or E-mail only. Understood? Good! And goodbye!" She went back to her wrapping, pointedly ignoring him.

He stared at her in surprise, and then turned and stepped from the store, stunned. He walked in a daze past the next few stores and almost missed seeing the quarter someone had dropped on the pavement. He picked it up realizing what a lucky find it was, right in front of a pay phone. He went to a booth, looked up the number of Flora's Flor-All, and then held up his coin. No slot.

"NO COINS NEEDED!" the sign screamed across the front of the phone. The letters flashed. "ZINGO PHONO NO PROBLEMO! COIN-OP? COIN-NOPE!"

He picked up the receiver and dialed the Flora's Flor-All number. An operator beeped on, saying, "Your name, sir?"

"Maxwell Brillig."

"Calling card?"

"Could I have this charged to my home phone?"

"Your number, sir?"

His mind went blank. He gave his mother's.

"Just one minute, sir," the operator said.

In a second, a new but familiar voice said, "Hello?"

"Will you allow a Maxwell Brillig to charge a call to this number?"

"That's my son!"

"Hi, mom."

"You can damn well charge it to your own number, Max!"

Good old mom. "It's just a local call. I just can't remember my own number. I never call myself."

Max knew exactly the kind of face his mother was making in the pause, and the words she restrained herself from using. Then she told the operator his number, and hung up.

"Just one minute, sir," the operator said. "That line is ringing but no one answers at your home phone. I'm afraid we can't let you charge a call to this number."

"Of course no one's answering! I'm here, at *this* phone!"

"You'll have to go to that phone number to confirm your identity, then. I'm sorry, sir."

"I'll *mail* this quarter to you!" he shouted.

The operator hung up.

At home he rushed for his phone. He would decidedly not call Flora's Flor-All. If they could afford to turn away his business, he would happily withhold it. Gloria, his date, probably didn't expect flowers anyway.

He punched in the number of Dial-a-Psych, and felt gratified to get a line immediately.

"Hello, this is Dial-a-Psych."

"Boy, have I got a gripe!"

"Modern society? It got you down?" said the sympathetic voice.

"Damn tootin'! I'm starting to hate the way things are going! Everything's being taken out of our hands and being replaced by artificial substitutes, and you can never get the real thing! And if you show someone the real thing, they won't take it! We've got all these ways of keeping each other at bay—we have telephones, and electronic mail, and credit cards and private cars and Me-Only Exclusive Virtual Shopping Malls! Anything that we can do to keep each other apart from each other, we do! I hate it! When are we going to get back to the real thing? You know, people talking one-on-one, relaxing, and trusting each other—all the good old things!" Even if he was too young to have known the good old things, he knew exactly what they were.

"I'm glad you can focus your anger so well," Dial-a-Psych said.

"Oh, I know my angers pretty well!"

"Can you think of a positive activity, to refocus your mind in that direction?"

"You bet! I'm going on a date tonight with a wonderful woman! She's finally agreed to go out with me!"

"Wonderful! Have a good time!"

"Thanks! I will!"

He hung up, a little relieved, even if he never felt entirely satisfied with these thirty-second sessions via telephone.

He checked his watch. He just had

time to get ready. He threw his clothes into the washer, tossing in baking soda since he knew that worked in a pinch. He showered, brushed his teeth, and then worked up a new sweat pacing in front of the drying machine as his clothes tumbled at their leisure. When they were ready, he dressed and admired himself in the mirror. He cut a dashing figure—a *humbly* dashing figure, admittedly, but a dashing figure nonetheless.

No sooner had he finished then the doorbell rang. He ran to answer.

When he threw open the door, he gasped.

"Hi," she said cheerfully. Gloria stood there, dressed perfectly in modest but chic fashion, with newly styled hair sweeping back from her appealing face. It was her, and yet—

"You're Gloria," he said. "But at the same time you *aren't.*"

"Well, that's true." She smiled shyly. "May I come in?"

"But wait a minute. What about you *isn't* Gloria?"

She looked at him with a tilted head, as if deciding whether to reveal a secret.

She decided in the positive. "Max," she said. "This isn't the real Gloria, actually. I'm just like Gloria, down to nearly all her memories—but I'm her surrogate. I'm her Comfy-Clone, Date-a-Fake Gloria. You see, this way I can go on a date with you at no risk to the real Gloria. How many heartbreaks and misunderstandings have arisen because of too-high expectations on the first date—or of broken illusions *after* the first date? This way, Gloria can rerun my memory tapes of our date at her leisure, and can decide on the basis of my experience whether she wants to continue the relationship or call it off—and all this at no inconvenience to her." The surrogate Gloria smiled. "Since I have all the personality and memories of the real Gloria, by going on a date with me you get the full experience of dating her, just as if she were really here. Isn't it wonderful? Now may I come in, Max?"

"I'm not sure I like this."

"Well, if you'd feel more comfortable, I could just go out with *your* Date-a-Fake—"

He slammed the door, and stood staring at its blank surface in disbelief.

Not *Gloria*—

Not the Gloria he'd spoken with, now and then, and had gotten to know a little in high school, and had just met again after they'd both returned from college—

Not *her*. It couldn't be *her* doing this! Gloria having a Date-a-Fake? She was too honest a person, too open, too *real* to submit to this world of substitutes!

Yet she had. The evidence stood outside his door.

The evidence, in fact, rang the doorbell and then knocked, and rang again.

Making sure it was locked, Max left the door and headed for the living room. He had nowhere to turn. He could order a six-pack of beer, and get drunk—but would it be real beer? Would it just be factory made—would they even have *aged* it, or would they have substituted some other process to replace the aging? And would he get *real* drunk if he drank the whole six-pack—or would it be a made-up drunk, caused by drunkenness-simulating chemicals in the drink?

He probably even lacked the option of suicide. He could probably only do it artificially. He might think he was slitting his wrist or swallowing a bottle of sleeping pills or hanging himself, but someone, somehow, would have arranged that he be swept into some artificial heaven, just to make sure he *thought* he was killing himself—so that he would be distanced from his own death, for heaven's sake! He almost cried out at the thought. Nothing would remain possible, then! While he valued only *real* things, the whole world had moved away: he'd been standing still, living his old life in the old ways, just as usual! Here, in his house, he stood alone while the rest of humanity rushed down the road, eagerly in pursuit of their once-removed, artificially real-feeling lives! What if his mother on the phone today had only been her answering service, a metal box imbued with her crankiness and voice! Inconceivable—and yet, if *Gloria* could—

And if even his *mother* and *Gloria* had given in to this idiotic wave of the plastic and the electronic, of the once-removed and the permanently removed, then what did the world have left to offer him?

The phone rang.

Warily he picked it up. "Hello?"

"Max?"

"Hi, mom."

"I was wondering if you were feeling all right. You sounded a little piqued this afternoon."

"The phone company—"

"I was going to talk to you about that, Max. Why are you using phones when they're so old hat? Get on top of things, boy! How do you expect to move ahead in this world when you're going backward? Things are happening! You could be hooked by computer voice-links and wristboards so you wouldn't even need a telephone, and here you are worrying about those Neanderthals at the phone company!"

"Sure, mom, but—"

"But what *you* should be worried about, at your age, Max, is finding yourself a nice young woman. Why don't you have a girlfriend, Max? Do you realize how old you are?"

"As a matter of fact, yes. And—"

"Good. Now see that you do something about it."

"About my age?"

"Smart aleck! That's my boy! I show a little motherly concern and what does he do, he gets smart! Take my advice, Max. Apply a little gumption to your rumption, and get a move on. The world's going to move with or without you. I tell you this with all my mother's love, Max."

She hung up.

"Love you too, mom."

He flopped onto the couch. Was he getting riled up about nothing? Did it matter if something was or was not the real thing? What *was* the real thing, anyway? What about money?

He took the bills out of his pocket. A century ago, people would have complained that the bills were anything but real, being nothing more than promissory notes. And coins, even if metal, were made of minerals with about the value of paper.

That word—"currency"—made a strange sense. A medium of exchange, to be acceptable, needed no intrinsic value. It only had to partake in the current framework of exchange, whether it was a matter of bartering, exchanging gold for bank notes, or giving and taking credit. Just because gold was more massive than a plastic card, did that make a gold transaction materially more substantial than a credit transaction? Which was real, after all: the gold, or the transaction? Maybe the cashier, Julie, had been right, in a stubbornly latest-thing-only way, to reject cash. She would have rejected pure gold or silver, after all. She would even have rejected outmoded gold or silver certificates. The bills he had offered her, while still widely acceptable, were simply old-fashioned—and therefore inconvenient—and therefore of reduced value in relation to the one real thing involved: the transaction.

Seeing the sense of it did nothing to smooth over his bruised sensibility, however. The whole telephone issue still bothered him.

But the instrument existed for his use, didn't it? So:

"Hello, Gloria?" he said when she answered.

"Is that you, Max? Is everything OK with my date?"

"I don't know. She's outside."

"Aren't you going to let her in?"

"Why should I? I'd rather be here on the phone talking to you than being with a Date-a-Fake."

"Oh, come on, Max. It isn't so bad as all that. She's pretty interesting, actually. I talked a little with her myself after I picked her up at the rental agency and had her imprinted. I was kind of surprised what I was like."

"Well, what if she *isn't* like you? It's *you* I want to spend time with."

"They're pretty good at these things, Max. She's probably as close to me as you can get."

"That's depressing. I was looking forward to something other than an imitation."

"Well, what can I say? You're just an oddball, Max. All the other guys who want to date me would rather go out with a Date-a-Fake—and sometimes they send *their* Date-a-Fake to go out with mine."

"Doesn't sound much fun to me. So what were you going to do tonight?"

"What do you mean?"

"Tonight. While I was out with your Date-a-Fake. I'd be out having fun, while you—well, what did you plan to do?"

"Oh, I'd spend my time here. Read a little. Do some laundry maybe. Something."

"Isn't that what you do all the time? How about dating in person, and actually *doing* something?"

"Boy, Max, are you out of the flatscreen movies or something? Where have you been? People don't date in person any more. That's an old form of personal interaction that's as obsolete as cassette tape players. There's a lot more efficient ways of getting to know someone."

"Like using Date-a-Fakes, huh?" Max thought about that. Cash or credit, versus the transaction: the transaction was what mattered. The real Gloria or her Date-a-Fake: was the date what mattered? The exchange of information about each other? The *efficient* sharing of time, to get to know one another? So dates were supposed to be efficient? Since when?

"Listen, Gloria," he said. "I admit I'm a greenhorn. I don't really do any dating. Most women I meet just don't seem so interesting. But you—you really got my curiosity going. You know, today I went to a florist's and was going to buy you flowers."

"That's a nice thought, Max."

"Well, they wouldn't let me. That's another story, though. I won't get into it. But now that I think about it I'm almost glad they didn't. Because I've started thinking about what it meant for me to buy flowers. But maybe I shouldn't get into that, either. I'm taking up quite a bit of your time, jabbering like this, aren't I?"

"Go ahead. It's interesting."

"Well, what do flowers represent? Sure, they're supposed to represent feelings, and the more expensive the flowers the more elevated the emotions."

"Such a cynic!"

"I guess so. But they not only represent something, they also serve a particular purpose. In our times they've become a kind of substitute for the actual process of expressing feelings and emotions—sometimes of even taking the time to get to know a person well enough to actually feel the emotions in the first place. So in trying to buy you flowers, I was really trying to buy a substitute for the patient, time-consuming occupation of being around you long enough to discover if we have enough in common to generate feelings."

"Are you always figuring things out this way, Max? I'm following you so far—but I think you're trying to tell me something, too." Her voice lifted with an edge of humor.

Max smiled. "Well, thinking about the flowers that way did give me an idea of what we should do. What we should do tonight, I mean. It would be thoroughly up-to-date. The latest thing."

"And what's that?"

"We should sit around and do nothing. Together."

"Together? You mean, just sit around?"

"It's what I said, isn't it?"

"That's so *weird*, Max."

"No, no, it's the natural outgrowth of all the new efficiency of communication and transaction. People need to pass time while the rest of the world whirrs along. After all, we just have to send out a few electronic commands to have most of our errands and chores done, right? So sitting around and just passing the time is the only proper response. Doing it with someone else—well, it sounds better to me than doing it by myself."

"You know, Max, I'm enjoying talking to you so much I'm almost willing to go along, weird as it sounds. But what about my Date-a-Fake? What do we do with her?"

"I've thought of that," Max said.

"You know, my mother loves keeping up on the latest things and all the high-tech stuff that comes into fashion. And Date-a-Fakes—well, I was just thinking I'd like mom to meet you."

*"Max,"* Gloria said.

She said it in such a way—

Not too strongly, not too softly—

That he knew he'd found the right words—

No, the right *flower*—

To give her.

It meant something else, too.

It meant that this time, with Gloria—

That maybe he'd finally found what he'd been looking for.

Maybe he'd found the *real* thing. The *real* thing, or else—

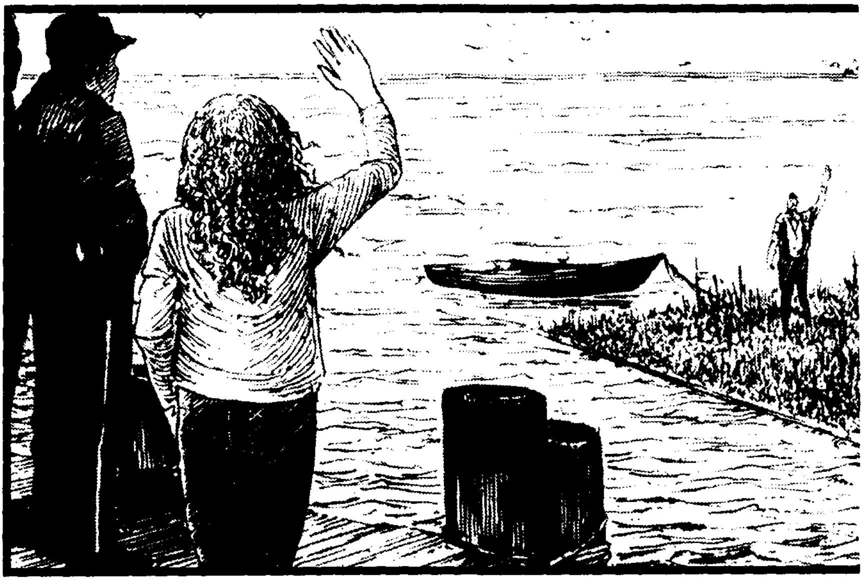
Or else he'd found a damned good substitute. ■

> If an alien was given one grain of wheat from Earth he could deduce *nothing* about the statistical nature of Terran life or seeds. The assumption that this is an "average" seed is poppycock. The alien, however, could *deduce* a lot of things about Terran life from that seed. But his tools would *not* involve statistics. He couldn't tell you how many species of lifeforms existed on Earth, he couldn't deduce the existence of animal life, couldn't tell you whether Earth contained intelligent life or not, couldn't tell you whether his sample wheat grain was large for its species, or small, or average. He couldn't tell you the average gene or chromosome count.
>
> Donald Kingsbury

A warm southeast breeze was rising as Mary Kelly parked her car and walked across the thin ridge of sand that divided the marshy pond from the open Bay. The tall cattails and pampas grasses waved like a field of wheat, their movement making a reedy rustling symphony beneath the chirping of the frogs and the occasional bird song. She searched the edge of the grasses for the spit of sand projecting out into the dark, brackish waters that would mark the beginnings of the path to Jake's shack. A few steps into the jungle of growth was enough to reveal that the path was clear, however, and she soon encountered the first plank on the long walk to Jake's shack.

Once among the grass, any cooling that she had from the breeze disappeared. In late August the marsh was redolent with life and the heady smells of rotting fish and decaying vegetation, all vital to the cycle of life in the Bay. A swarm of buzzing flies and mosquitos rose about her, their thin keening cries a bothersome noise in her ears. It was their larvae that fed the aquatic life of the marsh. They were the bottom rung of macrolife at the start of their lives and fed on the top rung as adults. Without the halo of insect life the marsh would die, and the Bay would soon follow. That was one of her responsibilities; to see that all the essential forms were preserved and cherished.

When she was younger she had heard of communities pouring oil on



### Bud Sparhawk

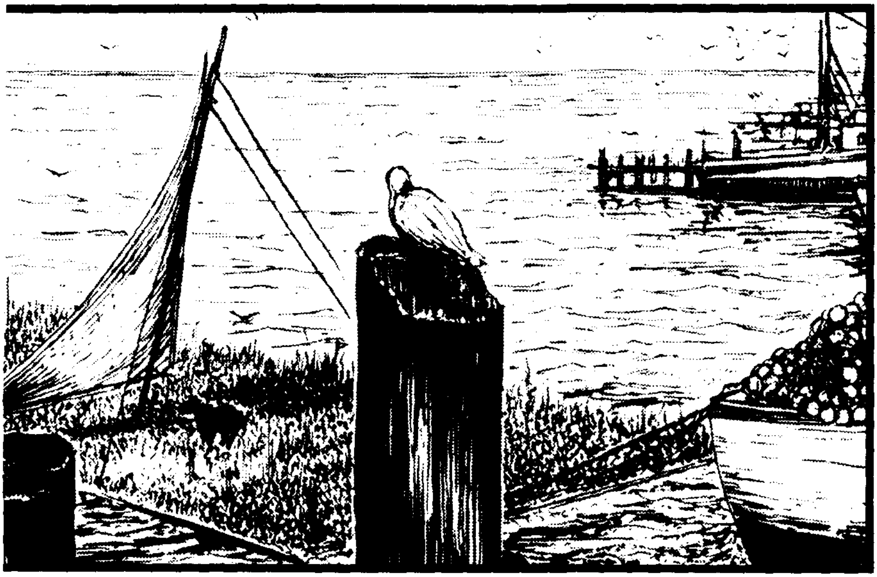
# MARY'S PRESENT

marshes such as this to kill the mosquitos. Some had filled them in with fly ash or construction rubble. Naturally the frogs, minnows, and larger game fish had disappeared as well. Eventually, even the ducks and Canadian geese wouldn't stop on their annual migrations. Some people regretted the loss, but at least they didn't have to worry about the mosquitos any more. Damn egocentric fools, she thought.

Jake's shack had been built on the edge of a small feeder stream between the center of the marsh and the pond, as he called it. The shack was typical of many of those built by fishermen around the Bay; its bare wooden siding a uniform gray from years of exposure. Twenty crazily angled stilts, searching in the rich black goo beneath for solid ground on which to lean, supported the floor of the shack and held it above the high tide.

The rambling walkway from the end of the sandy path ran to Jake's doorway. The walkway was as ramshackle an assortment of driftwood as she remembered. The wide gaps between some of the boards still offered a danger of a misstep, since the boards had been set to the length of Jake's own stride. This made her keep her eyes on the walk rather than view the wonders of this small inlet marsh.

She noted that all of Jake's boats were tied up beneath the small shack, indicating that he was at home and



*There may not be things "man was not meant to know," but there are certainly things people would rather not know!*

*Illustration by Christopher Bing*

not out tending his crab traps, fishing, or drinking coffee with his buddies across the way. Chessie, his mongrel retriever, barked a welcome as she emerged from the covering grasses and made the assortment of cats scavenging the fishing boat scurry for cover.

A long black box covered part of the shack's roof. It was a shallow affair, its interior a mass of convoluted hose, covered with Plexiglas. The hoses emerged from the box to connect to an oil drum reservoir. The entire assembly was painted a matte black. The components had been her present to Jake in return for his help on her initial survey of Bay grasses. Jake had assembled them into a solar hot water heater for his modest home using plans from one of his magazines. He was handy that way.

An assortment of solar arrays, chargers for his batteries, she supposed, lay on the roof beside the heater. Above that, near the peak was something new. It looked like a 55-gallon drum sawed open and the halves placed side by side. Some new solar gadget, she supposed. Jake had a penchant for assembling gadgets out of things that came his way. It was no wonder he had opted for the simple life, she thought; if he had been in the thick of civilization he would have gone into overload with gadgetry. Or maybe that had been his problem: had he been a scientist or engineer of some sort? Maybe he had been one of those on some failed defense program that was made obsolete by the fall of the Soviet empire. He never said much about his former lives and she would never pry.

"Hello," she shouted when she got closer. She had to stoop to pat Chessie on her oily head as the big retriever wriggled toward her in a shameless display of affection. The two of them had become fast friends after their first startling encounter. She called again. There was no reply.

As she drew closer to the shack she noted that the door and window were shut tight; a strange thing to do in such heat. Maybe he had gone out and shut the place up. But why would he not take the dog with him? She rapped lightly on the door. "Jake, it's Mary. Are you in there?"

The door swung open almost immediately. "Come in. Come in. Quickly, now," he said by way of greeting and waved her into the cramped interior.

A wave of cool air hit her face as she entered, startling her. "What . . . ?" she exclaimed. "When did you get air conditioning?"

Jake laughed and waved her to the one chair in the room, flopping onto his bed to face her. "Gadget's on the roof," he said by way of explanation. "Got the idea from a man over to Eastport. Split a drum and fitted some mirrors to the insides. Got a pipe runs along the focus that's filled with ammonia and runs into a water tank. The sun heats the ammonia—makes it boil, you know. I run it through a little water tank and let it condense."

Mary gave a little start of surprise. This was straight out of her physics lab. "And the condensation draws heat from the water and cools it!"

Jake beamed as if his prize student had gotten the right answer. "Yup. And I also run it through the solar heater to gather some more of the waste heat. The whole rig gives me about a hundred pounds of ice a day, if I need it to keep the fish fresh. Chessie likes her fish cold, you know."

"But where does the cool air come from?"

"Oh, I just have a fan that blows across the ice. Makes it real nice in here, don't you think?"

Now that she was used to it she realized that the initial feeling of coolness was just the change from the outside. Jake's primitive air conditioning put the cabin at a warm eighty plus degrees, not the frigid seventies she found in most homes and offices. Still, even a few degrees of cool was some relief from the stifling August heat outside. "Very nice," she replied.

After finishing the chicken and biscuits that she had brought for dinner, they sat on the pier outside and watched the huge red orb of the Sun sink into the smudge on the horizon that was the western shore of Chesapeake Bay. A scattering of clouds was being painted by the lowering Sun in golden hues that turned to rose and finally to dim gray as the light faded. It was a show unmatched by any other in the world.

The conversation went as most do, wandering about through the lives of both of them. Mary related her battles with the budget folk to get more funding for environmental studies. Jake responded by telling her about the half dozen herons that fished the shallow waters nearby at low tide. Mary mentioned the frustration she had in gaining recognition from her male coworkers. Jake pointed out the spot where he had seen a large snapping turtle surface the previous day. Mary spoke with feeling about the ongoing rebuilding of an improved relationship with her parents. Jake mentioned that old Sands, who had helped design his little sailboat, had passed away last year. Each mentioned the important things in their lives; each related the scale of the arena where they chose to live.

"Heard tell one of your floats was down by Eston," Jake remarked. "Doing well, are they?"

"You mean you didn't know?" Mary exclaimed with surprise. "Jake, they were your idea. I had no idea you hadn't even seen one yet." Somewhere along the line Jake must have been forgotten. She was sure that invitations to their construction and launching had been sent to him.

"Didn't want to go cross the pond," Jake remarked, referring to other side of the Bay, when he saw the concern on her face. "All them buildings and roads make me nervous," he explained. It was a typical 'shore man's excuse for staying on the rural eastern side.

Jake's gift to her was a concept to build a floating platform on which Bay plants, barnacles, and sea grasses could grow and be anchored in the shallow waters where natural marshes had disappeared. The platform would provide a perfect habitat for fish and crabs as well as acting as a natural filter for the waters around them.

She had taken that idea to her boss, Jim Shepherd, and, after endless presentations to officials from every agency dealing with the Bay and a mind-numbing round of political fundraisers, lunches, and dinners, had finally secured enough funding for a few *experimental* platforms; a feasibility study, they called it. Unfortunately the funding didn't go far enough to do anything meaningful. Only ten of the prototype platforms had been built by one of the Baltimore area aerospace firms. That was one of the political compromises they'd had to make. The key vote had been held by a politician whose constituents were impacted by cutbacks in the defense industry. This was a way of getting some credit for steering work their way. Mary was shocked at how quickly the funds disappeared.

Still, even with only ten platforms they could do some interesting things. They'd anchored one in each of the major feeder rivers; the Susquehenna, Patapsaco, Elk, Chester, and Choptank rivers. The rest were scattered in areas where pollution was suspected due to fish declines, habitat disappearance, or the like.

Each of the major rivers carried its individual load of pollutants into the Bay's ecosystem along with the fresh water that maintained the Bay's unique brackish mix. The Susquehenna drained a watershed that extended clear into the rich and over-fertilized farmlands of Pennsylvania and northern Maryland. The Elk drew waters from the Atlantic, thanks to the Chesapeake and Delaware canal which provided a route for foreign life to enter the Bay, not to mention an ungodly mess of ships' detritus and jetsam. The Patapsaco drained industrial Baltimore and contributed a rich assortment of chemicals and heavy metals, as well as the often ineffectively treated effluent of a major city. The Chester and Choptank were estuaries of the Bay rather than flowing rivers. Nevertheless the farms surrounding them washed a good deal of fertilizer and crop control chemicals into the water.

At the end of the season the institute would conduct a detailed examination of the flora and fauna that populated the platforms. Each oyster and barnacle, every root and leaf would tell the tale of what it had picked up from the waters and give a good indication of the degree of damage the Bay was suffering. These biological filters would reveal subtle things that their spot samples would miss and provide a good, long-term view of what was taking place over the course of a year.

Mary's original idea had not been to use the platforms as floating collection sites for the environmental studies but as change agents for the Bay. If they used huge numbers of them the sheer mass of aquatic life would actually filter the water and help cleanse the Bay. A flotilla of platforms would help replace much of the ecosystem that had been lost through development and industrialization. But the funds they'd secured could only go so far and this year's allocation was gone. She'd have to wait for the next round of budget talks in Annapolis to get any more.

"Listen Jake, I'm running down to Eston to check on the platform we put there. Maybe you'd like to come along."

"I might go that way when the weather cools a bit," he mused. "Been a while since I had the *Gull* out. Be a nice fall cruise." *Gull* was Jake's ten foot wesort-rigged sailboat; a flat-bottomed rowboat with more sail than sense. With him and the dog in it there was barely enough room to shift around when moving to a new tack. Fortunately Chessie had long ago learned how to avoid being dumped when the boat came about, and scurried forward whenever she saw Jake let go of the jib sheet and start to shift his weight. Jake, on the other hand, had learned that an eighty-pound dog moving about in a small boat must be taken into consideration. The two of them had learned much about swimming and righting a dunked wesort in the process of reaching their accommodation. "Yup, might be a nice little trip down there."

The tide was running north at this hour of the morning, making two-foot waves in the Bay. A front was coming through later in the day and the stiff breezes that usually preceded a storm were already kicking up from the southeast. The Whaler she had borrowed from the DNR handled the water well, planing over the tops of the waves with only moderate bounce. She noted the number of sea gulls floating on the surface, another sign of bad weather.

It took less than an hour to make the run out of Eston's tiny harbor down to where they had anchored the platform, and all but the last fifteen minutes was in the open waters of the Bay. She spotted it as soon as she rounded the sandy point that marked the entrance to Candle Creek.

The point was typical of the sand ecology in this part of the Bay. Beneath the dirty-looking sand was a web of roots and plant life; dune bean runners would weave under the deep dunes, Russian thistle and cockleburr would inhabit the inward reaches. Probably some marram, sand-reed, and psamma were also around, although she couldn't see it from this distance. Altogether they were one of the most interesting environments in the Bay, and one that was routinely destroyed by weekend boaters who didn't appreciate its wonders.

Candle Creek originated far to the east, meandered through numerous fields and woods before it came to Eston, where it wandered through the town like some drunken snake before heading in a straight line to escape into the Bay.

The institute's crew had anchored the platform out of the creek's main channel, quite close to an eroding bank that was gradually being undercut by the water's flow. The creek was calm and still as she cut the motor back and coasted to the side of the platform, holding out her hands to prevent the bow from striking the fiberglass flotation tube.

This high-tech version of the platform looked quite unlike Jake's original. Instead of logs the main flotation was provided by three twenty-four-foot pontoons made of layers of fiberglass. Instead of found lumber as cross members this version sported titanium struts epoxied into the pontoons. A mesh of polyethylene formed the base for the layers of humus and sand instead of Jake's rough net and straw arrangement. The platform would last forever, plus one day. That's one of the benefits from being built by a company used to dealing with MILSPECs, she mused. Now if only the damn thing didn't cost so much!

She moved the boat along the side, searching for the anchor bolts they'd used to tow the platform here. She found one near the registration decals: Since the platform was man-made and capable of movement through the water it had to be registered as a vessel and all the taxes paid, including the exorbitant yachting fee the feds had levied. They were sort of lucky in that; one foot longer and the fee would have been another $120 more per platform! She quickly drew a line through the tow anchor bolt and threw two half hitches to secure the boat.

A quick examination of the overburden indicated that several birds had chosen to build sloppy nests among the grasses. They were either cormorants or coots, she theorized. The grasses seemed to be doing well, although the sonnet looked slightly yellow. She looked out along the creek's bank and saw that only the cattails and pampas were present. None of the smaller grasses filled the spaces between. Carefully she pulled up a specimen of the sonnet, roots and all, and placed it in one of her plastic specimen bags for later examination at the lab. In another bag she put the usual samples of cattail root and leaves.

The submersed eel grasses also looked stressed so she removed entire plants from the underwater support instead of just a sample. As an afterthought she strained and struggled until she'd hauled one of the three mushroom anchors that held the platform in place into the boat. She scooped a generous sample of the muck that coated the inside into a collection bottle. Perhaps there was some clue in the residual sediments. She stirred the mud to see what squirming life was present and was surprised to find the muck strangely dead.

The rest of her examination of the platform was routine. It showed no signs of drift from its position. The mesh was providing enough support for the array of life on the top, and the bags of oysters that hung from the floats appeared to be surviving. She had put a few of those in her collection bags as well. Since everything was in order she worked her way back to the boat, set it loose and headed back out into the river. If she was lucky she would beat the dark clouds that were even now making their appearance on the horizon and be on her way back before the storm hit.

"PCBs, asbestos, and quite a bit of

metals—that's what's making your grass so yellow and killing the oysters," Donald remarked dryly. "Got to notify the EPA on this one, Mary. This stuff is really dangerous!"

"How in the name of bloody hell can this stuff be getting into Candle Creek?" she said plaintively. "There's no chemical factories around there. No heavy industry either."

"Well, that's not the only way these things get into the water. Lots of stuff contains these; industrial machinery, paints, antifreeze, cleaning solvents, just to name a few. I wouldn't be surprised if it wasn't some farmer's leaky drums stored away in a barn or some old stuff shoved into a culvert somewhere that's doing the damage. But that's not our problem. Let the environment boys track it down and handle it, that's their job."

Mary swore. "The EPA guys won't be able to get to this for another year, what with their workload and small staff. We need to do something sooner." To her mind this was the same as poisoning a city reservoir, only then just a few people were at risk, not an entire ecosystem. How could people be so stupid as not to realize what effects their actions had on the Bay? Damn, she was going to have to talk to Jim Shepherd about this, maybe he could spark some of his political contacts to take quicker action.

Jake had had a pleasant sail down the Bay in the crisp fall air. Sailing on the Bay was mostly a spring and fall affair when the breeze had some character and you didn't have a problem filling your sails with wind. Midsummer was the doldrums, limp canvas and water like molasses. Man could lose twenty pounds sweating away an August afternoon, it was so bad. But this morning was perfect sailing weather. He'd been on a fifteen degree heel ever since leaving home.

After he exited the Chester he took a long tack across the Bay to the mouth of the Patapsaco, and then back past Middle River where he picked up a nice off-shore and hightailed it due north past Banner Point. By the time he pulled into the harbor and walked up the slight grade to Eston night had already fallen. The diet of sandwiches and water that had sustained him through the long day had left him with a hunger for something more substantial, so he headed down Glochester to the Crabbin' Inn where he knew he could get some good cream of crab soup and a nice crabcake or two cheaply, it not being the type of place the tourists would likely visit. They could even provide a bit for Chessie, since they already knew her good manners and careful behavior wouldn't create a problem.

Margaret and two of her boyfriends were gabbing at the bar when they entered and took a seat. After five minutes, where he was left twiddling his thumbs, Margaret finally came over, threw a menu down on the table, and stalked back to the bar. "Hey," Jake called out. "What the hell did I do?" It wasn't like her to act so unfriendly.

Pete Stovall turned around from the bar and gave him a withering stare. "Damn eco-pussy of yours decided to kill the town. We figure that stupid floating thing of yours is what done it to us."

"I don't understand. How could the float hurt the town?"

"Seems Miss Ever-so-proper decided that her precious water was more important than our jobs. They shut down the plant. Said it was an environmental hazard." He raised his bottle of Thomas Point and saluted. "Here's to your damned ecology, Jake."

Margaret chimed in. "Lots of folks around here going to be hurt by this, Jake. Half the town was drawing income from the plant. And there ain't enough fishing, farming, and crabbing work had to be had 'round here. I figure those that have some savings will move out, and the rest will go on welfare or something. And welfare folk don't come 'round here for dinner, that's for sure."

Now that Jake knew that he realized what had struck him when he first entered. Usually the Crabbin' was filled with a dozen or more locals having a meal or a snack, instead of just the three of them at the bar. Maybe he'd better find out more about this situation.

Margaret's soup and crabcakes might have been their usual high quality, but eating them under the stares of the three at the bar made them practically tasteless. She'd not even offered to give the dog anything so Jake snuck her pieces of crab and most of the crackers under the table. He paid and left as quickly as he could. That night he and Chessie slept in the boat, under a tarp.

* * *

From what the mayor told Jake, the local situation was straightforward enough. The Eston plant had always been a marginal operation. Its two managers figured that, by spending little for maintenance, they could keep up an appearance of profitability, at least enough for their limited line, and keep the corporation from closing it down. Eventually the lack of attention to the physical plant resulted in rusting storage containers, leaking transformers, and decaying ceilings. The residue washed down the drains and into the creek, eventually finding its way to the Bay.

As soon as the corporation learned of the extent of the problem the plant had been closed. The only beneficial thing the corporation did was cap the drains and write a cleanup contract to CGI, washing their hands of all responsibility for what followed. Since nearly all of the workers were hourly wage rate there were no residual benefits, not even a health plan. The two managers were told in no uncertain terms not to seek transfers, or even further employment for that matter.

The town's congressman and state senator had tried to find a solution, figuring that it was their help to the institute that had caused the problem, something they didn't mention too loudly. Eston wasn't on a main truck or rail route, didn't have any natural resources to speak of, unless you wanted to corner the market on a poor grade of clay and sand, neither of which was in short supply in this eon. The pitiful excuse for a harbor allowed only a scant four feet of draft, making any hopes of attracting the tourist trade negligible. Most of the pleasure boating folk went to St. Michael's or Cambridge anyhow. The local soil was suitable for corn and strawberries and made melons taste like the inside of someone's commode. Even chicken ranching was out; Perdue had financed enough suppliers around the rest of the Shore that he didn't need one more.

Fishing and crabbing were also poor sources of income. The local oyster crop hadn't been good for years, and the clam market wasn't worth digging for them. This part of the shore didn't have enough estuaries or marshes to attract a large crab population. The few crab traps folks put out caught those heading up and down the Bay to more attractive waters and produced barely enough for a family's feast.

Neither did Eston have a trained pool of talent that would attract another company. The work at the plant had been simple canning and routine mechanical work that didn't require extensive training. Most of the people in the town were farmers or watermen and felt that was their true calling, even if they did have to do something else to live on. Jake had to admit that the future of Eston looked grim indeed. If even the politicos couldn't steer work this way, what hope did the town folk have?

Deciding that he wasn't terribly welcome, with half the folks damning him, along with Mary, for their misfortune and the other half planning on how to leave for better communities and cursing him for the drain on their savings, Jake pushed the little wesort into the water and hopped aboard to catch the outgoing tide. After navigating the shallow harbor he headed around the point to have a look at this platform everybody was so mad about. Mary had said they anchored it near the mouth of Candle Creek, if he recalled correctly, but he couldn't see it from the point. He turned and headed back out into the river when he noticed a smudge in the distance. It looked like an island, only there were no islands in this part of the Bay.

So quickly that Chessie nearly fell overboard with the sudden heeling of the craft, he brought the bow around, swung the jib across and leaned out to flatten the vessel in the water. The wind bit hard into the sail and pushed *Gull* forward. The tide was running out into the Bay so he gained a knot or two from that in addition to the wind.

Within an hour or so he had caught up with the free-floating platform and made his boat fast to one of the steel rings. Chessie leaped across into the grassy mat, happy to be free of the tilting sailboat and splashing water that rolled off her oily coat. Jake pulled up one of the platform's anchor lines and examined the ends. They had been cleanly cut just below the water line. Only a knife could sever a line that way, with no signs of fraying or stretching. Clearly someone in the town had taken their vengeance out on the most easily identified source of their problems and timed it to the change in the tides.

What was he supposed to do with

this platform now that he had caught it? It was too large to paddle and too heavy to pull. Since the platform was scarcely two feet high in the water it wouldn't show enough of a profile on radar or even to the eye until you were right up on it. That would be a hazard when it reached the eastern shipping channel. He hoped no freighter would be making its way into Baltimore when it got there; with the momentum those huge ships built up they'd have a hard time avoiding it, even if they could see it in the dark—and Jake didn't have to wonder at which would come off second best. Be a damn waste to lose something so precious to Mary Kelly. If it missed being hit and destroyed by a tanker or freighter in the night it might even wander farther down the Bay, come aground in some lonesome backwater, and become a swim platform for some kids. He had to think of some way to get this huge, awkward platform under control.

By dead reckoning he guessed that they were making about two or three knots across the bottom, mostly borne by the outward flow of the tide and with a slight push from the wind on the tall grasses. Maybe he could rig some sort of tiller and steer the thing to shore before they reached the opening to the Bay. Quickly he lifted the tiller from *Gull,* grabbed some line and lashed it to one of the aft cross spars of the platform. The tiller's blade only went down two feet into the water, hardly enough to exert much force, but even some steerage would be better than none. He tied the tiller so as to steer the platform toward the south side of the channel. After a long wait he saw that the combined forces of wind and tiller weren't going to be enough to save the platform. It would be in the Bay long before it turned enough to matter. How could he gain more control? He sat down on one of the pontoons and thought hard as Chessie sniffed the deterius for any hidden ducks or geese she might have missed.

A sailboat uses two devices to move through the water. The sail gathers the force of the wind and is the prime mover. But without a centerboard providing a corresponding and opposing force on the water a sailboat would only move with the wind. It would have little control over its direction. Jake wondered if the mesh support, marine growth, and roots that hung below the platform would act as a somewhat inefficient but workable centerboard.

Worth a try, he decided, and grabbed the bow of *Gull* to haul her onto the platform. It was a struggle to drag her through the heavy grasses to the center of the float. "Not the man I used to be," he muttered in self deprecation as he pulled the small anchor from the bow and lashed *Gull* to a cross spar. Once that was secure he raised the main sail and adjusted it to take advantage of the wind. He'd be sailing on a reach, so he could use the small spinnaker he kept on board. Quickly he ran the sheets through the two ring bolts at the platform's stern where he could adjust the angle of the sail. "Need a whisker pole, I guess," he muttered as he lashed the two oars together to form a heavy and awkward pole to hold the spinnaker in place. Finally he settled himself carefully to where he could see ahead, and waited for the wind and water to provide some help. He watched the land slip away as the platform started south, toward Poole's Island.

"Coast Guard . . . squawk . . . old man sailing an island, for God's sake," the radio blared. Mary snapped to attention and turned the squelch on the boat's radio down. She always kept it tuned to the emergency channel when she was working in the channel. It was too easy for one of the big ships to sneak up on you and wash you overboard with their wake. Better to keep the radio on and hear the warnings of the pilots.

"Right in the middle of the channel south of Eston. Better get the Coast Guard down there before it rams something." The voice of the Chesapeake pilot was on an edge between amusement and indignation. "Now that I'm closer it looks more like a pontoon craft with weeds on it. No, not a pontoon craft at all; there's a little rowboat, an old guy, and a dog on it. Damndest thing I ever saw."

Only one thing in that part of the Bay could meet that description. Mary thought, and that was one of her platforms. She grabbed the radio and turned to channel sixteen. "Vessel needs a tow," she called and read off the position the pilot had reported. When one of the tow pirates nearest the spot answered she gave him her credit card information, hoping Jim would validate the expense, and issued destination instructions. With luck the vagrant platform and its erstwhile captain would be returned to Eston by nightfall. She headed back to shore to get in her car for the trip down to Eston, taking a grad student or two along for protection. The people had not been terribly friendly the last time she visited and, if they had gone to the extent of cutting the platform loose, there was no telling what they might do to her car.

Quite a crowd had gathered to see the tow vehicle bring the platform into the harbor. Both the Coast Guard and the DNR boys provided an escort and, if her guess were any good, had their little citation books all ready. She waved to the DNR boat to come over. She knew most of them personally, and used them to take her to the platform. Jake and Chessie were on deck, sharing a mug of hot chocolate from the thermos. Most of the pirates had such little amenities for the people they rescued. A few of them even left it off of the list of charges.

"Never seen the like," the capt'n said as she stepped aboard. "I've pulled barges, and boats, and jet skis, and even a sailplane, but this is the first time I seen anybody sailing a freaking island in the Bay."

Meanwhile the Coast Guard were examining the decals on the float with some surprise. Mary imagined that they were disappointed that they couldn't fault them for not having a registered vessel in the Bay. Too bad. The DNR boys went over to explain a few things to them.

Jake nodded as she came aboard. "Didn't need no tow," he remarked. "Could have sailed it back soon's the tide turned. She's a bit of a weather helm, but moves along pretty well for a jury rig. If she weren't so damn high-tech I could have tuned her better."

Mary didn't doubt his words. With his experience on the water he probably could have sailed the thing around the world, and broken a record or two in the process. She looked at the way he had lashed together the sailing gear to turn the float into a sailboat. He just made the best of what he had at hand, and used his knowledge to solve the problem he faced.

Just then something clicked in her mind: The solution to the problem wasn't to wish for something different but to make use of the resources at hand. If Jake could do that to the float, why couldn't she do it with the town?

"Listen Jake, what if we figured out how to make the floats cheaper—use, oh, PVC pipe instead of those fiberglass pontoons? And maybe make the struts out of wood. If we made the construction cheap and easy we wouldn't need the skilled labor: We could build them anywhere!"

"Like Eston, I suppose," he replied with a smile on his face. "And they could use them around here to build up habitat for crabs and fish. Maybe get a decent crop of oysters, too."

Mary considered; the solution would take time to have the effect Jake mentioned, but she could use next year's budget to make a much larger number of platforms—probably make a hundred for the cost of just one of the current models. The politicians would go along if only to save face after the plant closing. Yes, and that construction work would restore some of the income to this place until the crabbing and fishing improves. Maybe the floats would even help clean up the residual crap in Candle Creek and restore the natural balance.

"Thank you, Mary," Jake said with a twinkle in his eye and a strong desire for some of Margaret's cream of crab in his mouth. "I guess you just returned my present." ■

*Editor's Note: This story is a sequel to "Jake's Gift," in our September 1993 issue.*

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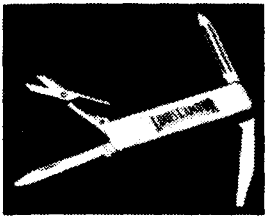

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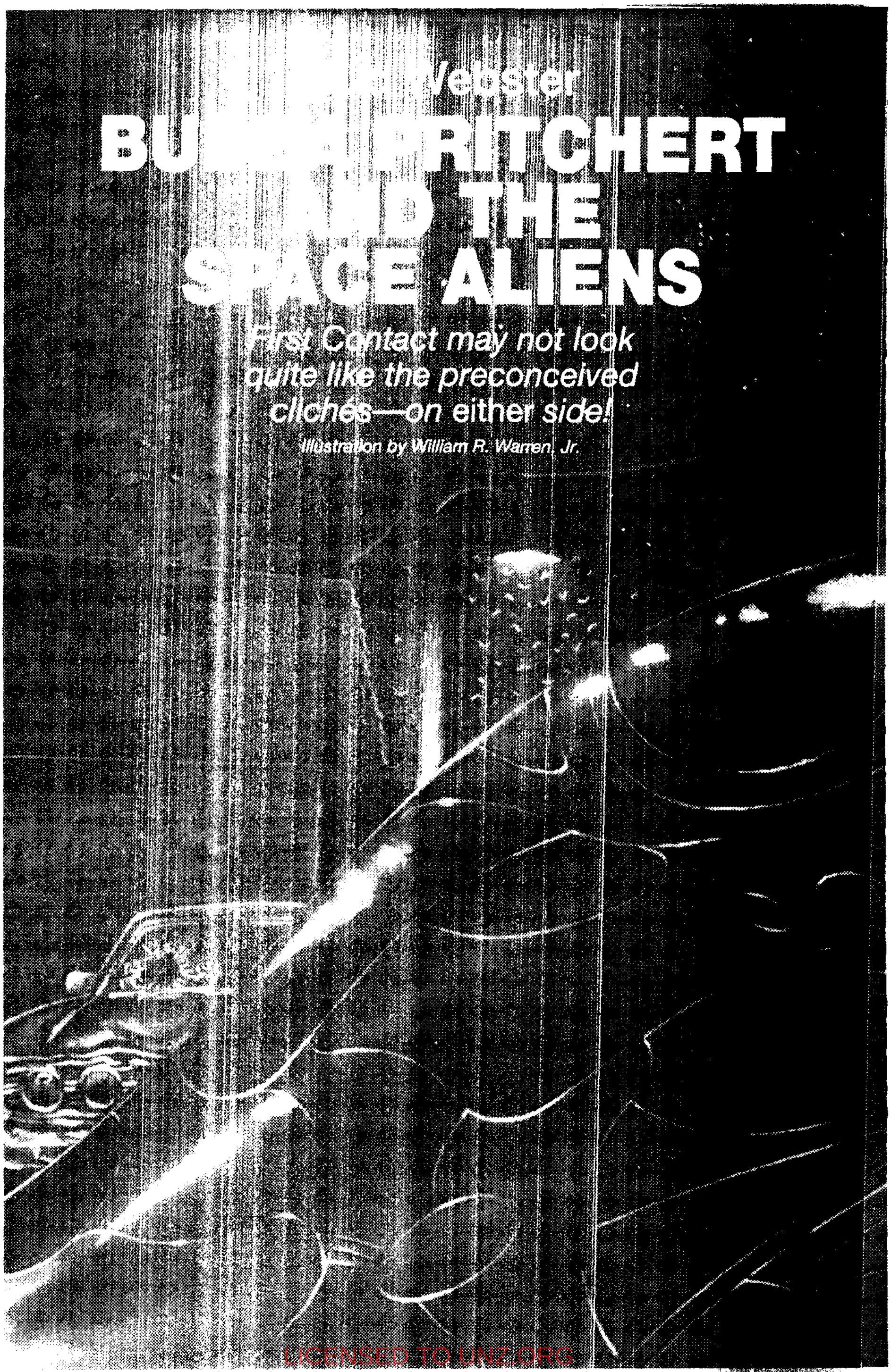
# BUBBA PRITCHERT AND THE SPACE ALIENS

*First Contact may not look quite like the preconceived clichés—on either side!*

*Illustration by William R. Warren, Jr.*



Bubba knew there was something peculiar going on when the flying saucer dropped down behind the Bowl-a-Rama. He'd been sitting on the front steps of the Eat'n'Run nursing a bottle of Anchor Steam, munching an occasional peanut and enjoying the late night air when the sky overhead lit up and he heard a sound like air escaping from a tire.

Everybody else in the little town of Central Garage was over at the VFW hall for the Bean Supper and Dance, except for Bubba and a few other misfits who couldn't get dates, didn't like beans, or hated to dance, so he knew the chances of anybody else seeing the thing land were slim. He threw back the rest of the beer, folded the peanuts carefully in their bag, and wiped his hands on his overalls before getting up and making his way to the Bowl-a-Rama parking lot.

It was a pretty thing, all smooth lines and curves, and it looked like it could go like white on rice when you put your foot in it, but Bubba figured there was only one reason for this thing to be in a bowling alley parking lot this close to midnight on a Saturday: engine trouble.

Hands in plain view, he strolled up to the saucer, rapped sharply on the side, and waited. After a moment, a panel slid back from a viewport, and two faces peered out anxiously. Bubba grinned at them.

"Evenin'. How's Elvis?"

They looked at each other, then disappeared. The panel closed.

Bubba stepped back a bit, figuring they'd be out soon enough. There was still at least another hour left before the dance broke up, and he wasn't one to rush things.

Sure enough, a few minutes later a hatch opened and two very human-like figures stepped out onto a platform, one a bit shorter than the other.

The three looked at each other. The aliens saw a largish human, with a scraggly beard and short salt-and-pepper hair sticking out from under a cap emblazoned with the letters "CASE." Bubba saw two humanoids dressed in smooth, well-fitted jumpsuits with small insignia in the center of what he assumed were their chests. They were fidgeting.

Their primary non-human characteristics seemed to consist of a bifurcated upper lip and a flattish nose with what appeared to be one large nostril. What cranial hair they had seemed to be either fine fur or feathers. They were conferring over something that looked like a small Etch-a-Sketch. Their discussion became more heated, and they glanced in his direction from time to time. Bubba smiled and nodded, idly jingling the change in his pockets.

Finally, the shorter one nudged the other forward a little with his elbow. The taller one cleared his throat and spoke in a clear, if slightly nervous, voice.

*"Sprechen sie Deutsch?"*

Bubba shook his head, smiling regretfully, and there was another, shorter argument.

*"Cu vi parolas Esperanto?"*

"Nope. Never could get the hang of it. You boys ain't from around here, are you?"

Again, a hurried conference over

the little screen. The smaller one stepped up and said, "We-fella camap, spik yu tudak. Numbawan Boss send us, wokabout planty longway tru Sky." He pointed at the saucer. "Big Silver Bird b'long us, him sick-fella." He licked his odd lips, and they looked at Bubba expectantly.

"Nope, don't speak that Melanesian stuff either. You boys talk any English?"

"Ah, Ang-lish! Si! Uh, yes."

"Then we would seem to have an avenue of communications here. I 'spect we'd best capitalize on it."

"Yes. Catalyze."

"Damn right. First thing is to get your Silver Bird here out of Big Dave's parking lot before Deputy Beeson calls me to haul it off."

"Is not for flying without much working. Wheels have no."

"No problem, I got a flatbed."

The two exchanged a quizzical glance. "Is not for sleeping?"

Bubba grinned. "Tell you what. I'll work on your Bird there while you boys work on your syntax. I mainly do racing stock, but I'll give her a try."

With help from both of the aliens, Bubba got their ship on the flatbed and into the garage without anyone else seeing them. He used his biggest chain hoist to pick it up, drove the truck out from under, and set it down on his tallest blocks. Absentmindedly wiping his still pretty clean hands on an old rag—he did this often when thinking—he walked beneath it, examining the undercarriage.

"How's this sucker work, anyhow?"

The taller of the two pointed to a row of movable slats. "This sucker use ground effect for lift up, impulse drive do rest. See?"

"Ground effect? You'd need a hell of a lot of fans to lift this thing."

The alien shook his head. "Mass have not, when under power."

"You boys got inertialess drive? Don't that beat all. We ain't got past internal combustion, ourselves. I don't much care for the noise, and I hate the stink and fumes, but it keeps me working." Bubba shook his head in admiration. "You got some kind of owner's manual for this rig?"

The smaller alien handed him the screen, after making a few adjustments. "You ask query, it talk back in Anglish."

Bubba took it. "Well, don't that beat all." He held the screen close to his face. "You got any idea what kind of problem these boys might be having?" he asked in a loud voice.

"Speculation is inconclusive without a direct analysis of the on-board systems. Direct analysis may be accomplished by inserting this unit in any maintenance slot. You don't have to shout, you know. I can hear you."

"Don't that beat... hmph." Bubba shook his head again. He found a slot the right size for the screen to fit, and gingerly pushed it in. The unit clicked twice, then peeped.

"Direct analysis completed."

He pulled it out, scratching his head in confusion over the symbols and formulae now scrolling past. "Don't know as how any of this voodoo is going to give me too much help, here. Can you translate it?"

"If your system uses a binary code

of some sort, I can analyze the data structures and adapt my operating system. If you have a computer with a suitable interface and the proper software, I can download the files and perform the conversion."

"That's a big ten-four. I got a 486 with 32 megs RAM, disk space out the wazoo, a high-dollar CAD program, and all the engineering tables you'll need. Interface might be a problem, though, if all you have is that slot setup." He thought for a moment. "Might could call in a good buddy. Past his bedtime, but he wouldn't miss this for anything. Let me just set these ol' boys up with something to keep 'em occupied, and I'll make a phone call."

Bubba led the two aliens into his living room, sat them down on the couch, and turned on the television. "You're in luck, gentlemen. I got a 15-foot dish on top of this building, and you got a choice of pretty much anything from 'Shakespeare On Ice' to 'Cooking With Mice.' Help yourself," he added, handing them the remote. "Just push this little button here to change the channel."

Leaving them to entertain themselves, he dialed a number from the kitchen phone, letting it ring a dozen or so times. After a while it was picked up and a sleepy voice said, "I hope this is worth it."

"Evenin', Woody. How's it hangin'?"

There was a pause on the other end. "You know how much I hate that nickname, Bubba."

"Got your attention, didn't it? Listen, I got a situation here, old son. I need you to bring your toolbox out here, pronto monto."

"You're joking, right? It's almost an hour to get out there, not to mention that I was, until a few minutes ago, more or less fast asleep."

"Kermit, it's SauNA business."

There was a longer pause. "You serious?"

"Never more so."

"Jesus. I never expected . . . son of a BITCH!" He was fully awake now, and very excited. "What do you need me to bring?"

"Whatever you can. We need to connect my box with some sort of portable artificial intelligence so they can talk turkey at each other. I would suspect you should pack along some sort of high-power modem, a handful of cables, a little of this and that. I have no real idea what you'll need, so I'll leave it up to your discretion. You're probably gonna need to hardwire something, and you know how good I am with a soldering iron."

"Yeah, about as good as I am with a torque wrench. I've got just the thing, but I'll have to sneak it away from the lab. Can I bring a camera?"

"Lemme check. Hey," he said, addressing the screen. "Any objections to my buddy bringing his camera? And what do I call you?"

"I have no objections; Meier wasn't believed, and you won't be either. My designation is useless for anything but maintenance purposes. Call me what you like."

"Billy Meier had other problems. I think I'll call you Mycroft, then. I don't suppose you've read any Heinlein?"

"I have no visual receptors, no, but I am familiar with the name from your broadcast media."

"Don't that . . . Kermit, Mike says camera's OK. Bring it on."

"Mike?"

"It's the obvious, don't you think?"

"I guess so. Give me an hour, and I'll break my buns getting out there."

"I'll expect you when I see you coming."

After hanging up, he checked on the two aliens. They were still seated on the couch, avidly switching between channels; the tall one seemed to want to stay with MTV, and the shorter one was arguing in favor of "Gorgeous Ladies of Wrestling." Occasionally they blew quick puffs of air through their split upper lips, making a sound like a horse's snort.

"Excuse me, boys," Bubba said when he caught their eye. "Might I assume that you both have a name of some kind, or are they useless for anything but maintenance?"

"I beg parton?"

Bubba chuckled. "No doubt, I know I'd like to. What do I call you?"

"Oh. Names in your language are not so. For pronounce in Anglish is much hard."

"Well, I just hate to say 'Hey, you.' "

The alien shrugged. "You give us Earth-names for now, maybe perhaps?"

"Doubtless." He thought for a bit. "How about Ike and Tina?"

There was a burst of static from Mike. "It might be more appropriate to call them Stan and Ollie."

"You might just could be right. OK, Stan and Ollie it is. Boys, we haven't been properly introduced as of yet, and as this is first contact between you and us, it behooves me on this auspicious occasion to welcome you to Earth and King William County. Mike," he asked, turning to the screen on the kitchen table, "can these gentlemen's systems absorb alcohol?"

"No, but it will do them no harm, either."

"Well, then, by God, have a beer." He twisted the caps off three Anchors and handed them out. Raising his own bottle, he said, "May your cesspools never run over."

Both imitated his gesture, and Ollie (the taller one) said something in his fluid language. Bubba asked Mike for a translation, and the box said that by the closest equivalent it meant "May you always keep your feet free of the grasping tentacles of the Wailing Beast."

"Thank you kindly, Ollie. I'll certainly do my best."

Stan and Ollie went back to their cultural debate, and Bubba went back in the garage with the screen.

"What's the story on those two, Mike? They seem to be nice enough boys, but they apparently don't know too much about maintaining that ship over there."

"They are minor functionaries of the branch of our government which surveys the remote areas surrounding our sphere of influence. Their job is to investigate the levels of technology and culture of the indigenous races and to prepare reports for their superiors. They mean well, but they are by no means mechanically inclined. I think the term 'paper shufflers' would be the best description, although technically, they're my superiors."

"Well, that explains a few things. Are we about to be offered membership in the Galactic Confederacy?"

"No. To my knowledge, nothing of the sort exists."

"Then why buzz around this unimportant little system?"

Mike paused. "Have you ever known of any bureaucracy that could keep its hands to itself?" It buzzed. "They're less interested in information than in looking busy when appropriations time comes around."

"Gotcha. Pretty much the same here."

"I have news for you, it's pretty much the same everywhere."

"That's a depressing thought. On more technical matters, what am I going to need to get that Bird back up in the air?"

"A well-equipped machine shop, a small amount of fairly high-density matter for reaction mass, and the proper tools. I can do most of the rest myself."

"How dense?"

"Iridium or osmium would be best."

"Hard to come by. Dinosaurs ate all the iridium, and it killed 'em off. Don't know of anywhere I can get osmium at this hour."

There was another burst of static from the screen. "Of all the mechanics we could have chosen, we have to get a wise-ass."

Bubba laughed. "How about lead? It's only about half as dense, but I got plenty of it here." He pointed to a stack of old car batteries in one corner of the shop.

"As long as it's clean, it will do nicely."

"I'll set Stan and Ollie to breaking up the cases and pulling the plates out. I've already drained and flushed 'em, so they're clean."

After explaining to the two aliens what needed to be done, Bubba uncovered his machine tools. "OK, Mike, what kind of parts are we going to have to make, and what are we going to make 'em out of?"

"We'll need several three-dimensional cams, the precise measurements for which I can't give you until I can do the conversions."

"Three-D cams? Don't think I can cut 'em on a lathe, so they'll have to be machined. Hmmm . . . how smooth do they have to be?"

"Not very, they rotate in a plasma bottle rather than against another surface. The space inside the bottle is shaped, and as the cams rotate, the shape alters."

"Never mind the rest, I don't have the math. What's wrong with the ones you have now?"

"They have become distorted by the pressures that maintain the plasma bottle; they've flattened along one axis and have bulged along another as a result. They're no longer precise enough to take us a long distance."

"In case I can't get 'em down to the closest mil, can it be compensated for?"

"The on-board system can, yes. Most of my memory is replicated in the ship, except for the AI portions, and it handles almost all of the drive and navigation functions."

"Well, all we can do is wait for Kermit, then. He should be along in a few minutes." Bubba thought for a while, then said, "You mentioned that I'd been chosen. What's the deal? I mean, I know I'm a bit above the average, but you must have been monitoring any number of people besides me. How'd I get picked?"

"You were known to us, as were several hundred others with similar qualifications. You're a member of Mensa, Citizens Against the Crime of Silence, the ACLU, and a number of other politically-oriented organizations. What set you apart from the others was your founding of and long-time involvement with SauNA."

"Saucer Nuts of America? Why that?"

"Your interest in UFOs indicated that you'd be more apt to accept our presence without running in circles, screaming and shouting. The fact that you'd given your organization that name indicates that you'd be less likely to make a big deal out of it to get your name in the papers. We don't mind certain people being aware of us, but we do hope for discretion. Your mechanical aptitude goes without saying. You've been on our list for quite some time in case of a situation like this one."

"Why now? I mean, why not last year, or a week ago?"

"Up until now, everything's been OK."

"Hmph. Ask a silly question.... Look, I don't know how much you know about us, but we got some pretty serious problems on this little ball of dirt. Our workable technology is stagnant. Everything we build seems to do more damage than good, and in the long run all this labor-saving crap we make is slowly burying us in piles of indestructible garbage. Plastic. Medical trash. Radioactive waste with a half-life of ten thousand years. Hide-bound auto manufacturers with no interest in alternative fuel sources beyond lip-service. Quick fixes piled on top of mistakes that throw the whole ecology out of balance. Now, I figure that you've got some sort of fusion, given that you're advanced enough to have inertialess drive, am I right?"

"Yes. The fusion reactor uses almost any mass, and is based on technology that is compatible with what you already have. It could be produced in quantity for not much more than the price of a week's groceries, and sold at correspondingly low cost."

"Well, I'm here to tell you that we could sure use it, old hoss. What do you think?"

There was a fairly long pause before the screen replied. "I understand your need, and I agree that your people would benefit greatly—"

"I think I hear a 'but' coming."

"I'm afraid so. I am unable to give you this information."

"Unable, or unwilling?"

"Unable. There are safeguards on that portion of my memory that prevent me from revealing the technology as long as I'm a representative of our parliament. If I could help you, I would. I'm sorry."

About that time, there was a knock

at the door. "That'd be Kermit," Bubba said.

Kermit entered, carrying a tool kit and a long box, his camera bag slung over his shoulder. His eyes were still a little bleary, but he was excited.

"Where are they? They haven't left, have they?"

"Nah, they're in the living room watching 'Celebrity Jello-Wrestling for Dollars' or some such rot. What'd you bring me, Mr. de Frog?"

"It's a Racal-Vadic modem. Verrry fast, faster than factory specs as a matter of fact. I've done some tweaking."

"Like with my car horn?" Bubba had picked up a programmable auto horn at a flea market and Kermit had fixed it somehow so that if anybody tried to program "Dixie" it would play the theme from "Shaft" instead. Bubba himself stuck with the opening bars of *The Rites of Spring* or the Rocky and Bullwinkle theme.

"Yeah. Listen," his voice dropped conspiratorially, "what do they look like?"

"Stick your head around the door and look, son. They won't bite you."

"Yeah, but are they . . . different? I mean, I'd hate to walk in there and scream or something."

"Don't worry. They're disappointingly humanoid. Don't speak English too well, but it is their second language. Or their twentieth. Not to mention their mouthal equipment is a *bit* different from ours. Just keep your feet clear of the grasping tentacles of the wailing beast, is all."

Kermit nodded absently and edged into the living room, still clutching his load. "Ummm . . . hi. Welcome to the Earth."

Ollie smiled, raised his beer, and said "Rock and roll."

Stan repeated the gesture and said, "I'm going to pull that over-stuffed blonde bimbo's head off and spit down the hole."

As Kermit tried to figure this out, Bubba called from the kitchen, "Hey, sounds like they been practicin'! Think we oughta switch 'em over to Masterpiece Theater?"

"No, I don't think Alistair Cooke could stand it."

"Aleister Crowley could."

"He's not on PBS."

"Nope, A&E. 'Magick and Mountaineering,' Thursday nights."

"That's my bridge night. Jesus," Kermit exclaimed. "I still can't believe this is really happening."

"Trust me, son. How about hooking some stuff up so we can get started?"

"Yeah, right." Kermit opened his tool kit and began setting up the modem. "Where's Mike? I need to look at his bus, or whatever he has."

Bubba brought the screen over to the work table, and pointed out the connector that fit the slot in the ship. "That's what we need to hook up to, and since I know exactly diddley about it, I'll let you work it out together. I got another phone call to make."

Kermit set out his tools and began to work.

Bubba walked back to the kitchen and dialed. It was answered after only two rings.

"Kirby, this is Bubba Pritchert in Virginia. Do you ever sleep?"

"Only from the neck down. What's up, Bubba?"

"I may have something here that I need some advice on, and since you do legal work for Greenpeace I wanted to tug on your coattails about it."

"Go ahead."

"Let me give you a hypothetical situation, and you tell me what can be done. Suppose I got hold of some brand new, and very important, technology. Suppose further that it could change the face of civilization as we know it."

"The face of civilization, huh?"

"As we know it, yes. How could I go about getting a patent?"

"I doubt you could, unless you could prove that you yourself had originated it. Patent law's terribly sticky about that."

"Well, I can't say I invented it, no. How about if the information was given to me, or that I somehow acquired it, legally?"

"Hmm. Different situation entirely. What's this got to do with Greenpeace?"

Bubba thought carefully, then said, "Suppose Greenpeace had the development and manufacturing rights to limitless, clean, cheap, non-polluting cold fusion? And technology that would make internal combustion obsolete?"

There was a long silence at the other end. "If this were anybody else, Bubba, I'd call you a crank case and hang up. What are we talking about, here? How cheap?"

"Bushman cheap. At the moment, I got nothing definite, and I ain't promising anything. If I told you more, you *would* hang up, and I wouldn't blame you."

"OK, why don't I do a little reading, and get back to you?"

"Fine as frog hair, Kirby. Keep 'em flying."

"I do try."

Bubba hung up and looked toward the workshop where the ship sat on his lift. He chuckled. "So do I, Kirbs, so do I."

When he returned to the workshop, Kermit was still hard at work, peering through a lighted magnifier and delicately manipulating a soldering iron. He'd surrounded the area he was concentrating on with heat sinks, and was carrying on a lively conversation with Mike at the same time.

"OK, I got that one. What next?"

"Solder a jumper from the next contact to the second blue component from your left. Make sure the three pinholes on top aren't occluded."

"No sweat, I'm good at this."

"Yes, you are. We're progressing much faster than I had anticipated."

"How's the heat?"

"Dissipating nicely. Once you've finished that, we can attach the cables to the modem. That will complete the conversion, and we can begin the translations."

"OK, I'm going to have to scrape those contacts a little. You've got them coated with something that doesn't like solder. You know," he said, turning to Bubba, "I've never had a patient talk back to me before. It's refreshing to know just where it itches."

"Just like 'Spock's Brain,' huh Bones?"

Suddenly, Bubba stiffened as a thought occurred to him. "Say, uh, Mike. Has Kermit voided your warranty?"

"I'm not sure what you mean."

"Well, you got all these wires hanging out of you, solder joints and such. You don't look much like you did when I plugged you into that slot. In fact," he said thoughtfully, "I doubt very much if I could plug you in the way you are. Now, I can't say for sure, but mightn't that make it difficult for you to operate normally?"

Quite suddenly, there was an extended burst of noise from the screen. Mike was clearly agitated, if the characters scrolling across the screen were any indication. They were jumpy and scattered, mixing standard English characters with alien.

"Bubba, I must speak with my supervisors. It is of great importance."

"OK, I'll call 'em in."

When the two aliens saw the cobbled-together connections, they grew excited and began talking rapidly in their own language. Mike interrupted them, speaking just as quickly. Ollie pointed to the solder joints and threw up his hands, while Stan attempted to calm him, speaking softly and slowly.

"What's going on, Mike? We screw up?" Kermit asked, a little nervously. "I'd hate to be vaporized or something."

"That would depend on your definition of the phrase 'screw up,' Kermit. Ollie is certainly unhappy, but you're in no danger. We're not a particularly violent race."

"I know I should be reassured by that, but—"

"Let me speak to them." Mike began talking quickly, Stan nodding from time to time and adding his own comments. Ollie looked from Bubba to Mike, occasionally asking the screen questions, and clearly thinking hard about the answers. Finally, he shrugged and spoke, pointing first at the screen and then at Bubba. Stan clapped his hands, obviously pleased, and nudged Ollie, who grinned a little ruefully and made a gesture that clearly meant "What the hell?"

"Bubba," Mike said, "we have much of importance to discuss. My supervisors have determined that, with the modifications Kermit made in order to interface with your computer, I am, as you conjectured, no longer able to interface with the ship. As these changes were done for the repair of the ship's power systems, the adaptation was necessary and inevitable."

"OK," Bubba said slowly, "What does that mean, exactly?"

"I have been classified as damaged equipment. Since I am no longer able to function as I was, I have been, in your idiom, discharged."

Bubba stared. "Fired."

"Yes."

"No longer a representative of your parliament."

"Yes."

"And whatever knowledge you have of the technologies involved with the Silver Bird. . . ."

". . . Is now available to you, yes."

Bubba sat down. "Well, drop me in

dog-shit." Absently, he took out his rag and began wiping his hands. "This is . . . a tad overwhelming, Mike."

"Wait a minute, guys," Kermit said. "Bubs, we've read enough SF to know that his home planet isn't going to allow us to have this kind of technology. It stands to reason that they have some sort of laws against it, and a standard operating procedure to prevent it. How about it, Mike?"

"That is correct. There is a device built into my circuitry that will wipe my files when triggered." He added a few words in the alien's language, and Ollie nodded. He took a small object about the size and shape of a matchbox out of a belt pouch and held it up.

"We owe you much," he said in English. "You are friend to us, and you fix for us to get home. This is auto-destruct for Mike," he said, and dropped it. Stan leaned nonchalantly against the workbench, then flicked a heavy wrench onto the floor, smashing the little object into tiny bits.

Stan and Ollie looked at each other and said in unison, "Oops." Then they left the garage and moments later Bubba heard the opening bars of "Oh, Fortuna" from *Carmina Burana*.

"What the hell are they watching now?" Kermit asked, blinking in bewilderment.

Bubba waved a hand in dismissal. "Any of a half-dozen bad movies. We got to think, Kerm. There's something pretty momentous going on here, and I just don't know how to deal with it."

"You're going to be a rich man, Bubs. Rich and powerful."

Bubba shook his head slowly. "I don't want that, Kermit. I got no illusions about my place in the scheme of things. I got whatever I need right here, and I got my work. Who the hell needs big money in Central Garage? Hell, we're only half a day from Frog Level, and nobody else in the world can say that. And I'm certainly no more capable of wielding this kind of power than your average panful of scrapple is." He stood up and tapped the screen with his fingers. "I dunno, Mike. I'm at a big loss for what to do, at least until Kirby calls back."

"I'm sure you'll find a way to use it, Bubba. In the meantime, Kermit, if you'll do the honors, we can get the ship fixed before my ex-supervisors become addicted to television."

After Kermit plugged in the cable, Mike called up the CAD program and drew the cams in wire-frame, with their dimensions marked. The shapes were too complex, it was decided, for milling.

"Tell you what, guys. I did some metal-casting in college, and I think that might do a better job," Kermit remarked. "You've got some bronze stock here, don't you?"

"Yeah, bar and sheet, I use it for bushings. Got a blast-furnace, too. How do we do it?"

"Well, the easiest way would be lost-wax. We'll need plaster, and you'll probably have to smooth off the rough edges a little. Mike," he said, "do these measurements have to be absolutely precise?"

"No, Kermit. The on-board system is capable of making adjustments until we get to a nearby outpost. As long as the cams are made of non-ferrous metal, they'll do fine."

"In that case," Bubba said, "how about lead? Be a whole lot easier to handle, and it'll set up quicker. Easier to trim, and I got plenty left over."

"OK. Great. Let's get to it."

"I've got some beeswax around here, too. Let me see. . . ." He rooted around in a drawer until he came up with a box, then cut it into blocks roughly the right size.

Kermit set about carving the wax into the correct shapes, roughly an inch on a side, carefully checking against the images on the screen and using calipers. When it was done to his and Mike's satisfaction, he began rolling out a long, narrow "snake" of wax, which he then cut into shorter lengths. "You have to vent it. Otherwise, the form'll blow up." He attached the snakes to the cubes, and said "Bubba, time to mix some plaster. We'll need a block about the size of two bricks."

"I can do that. Bucketful be enough?"

"Fine."

When the plaster was ready, Kermit pushed the cubes into it, making sure that the vents weren't covered.

"Now what?"

"We wait about an hour for the plaster to set. We should let it go overnight, but we don't have that kind of time. In the meantime, how about some pictures?"

In the ensuing hour or so, Kermit had the aliens pose in front of their ship. He got shots of them watching television, eating microwave popcorn, and waving happily at the lens while pointing at the Central Garage Corporate Limits sign.

Finally, the plaster was as set as it needed to be, and Bubba started his blast furnace. Throwing a bar of lead into a heavy crucible, he opened the door of the furnace and stuck it in.

"Now what, Kerm?"

"We bake the mold."

"Bake it?"

"Yep. Melt the wax so we have a negative impression of the cams."

"Bring it on into the kitchen, then."

Within a few minutes, the wax had run out of the vents, and they were ready to pour in the lead. Kermit handled the ladle himself, with the others looking on in interest; apparently, Stan and Ollie had never encountered anything of the sort, and they kept up a running commentary.

After an hour (and more pictures, including several with Stan and Ollie working out with the Body Shapers), Bubba broke open the plaster mold with a hammer, and the two small cubes were trimmed and checked against their specs. Mike pronounced them adequate for the purpose, and Ollie installed them in the ship's drive.

While they were calibrating the drive systems and making a final check of the ship before departing, the phone rang.

"Whatcha got for me, Kirby?" Bubba said when he picked it up.

"How'd you know it was me?"

"Who else but a lawyer would call at five in the morning?"

"Your Aunt Nell, maybe?"

"Naw, she'd just send the Rolls. What news, Osiris?"

"Can you get some kind of affidavit signing over patent rights? Because without that, you're more or less up the creek as far as making any money off of whatever it is you may or may not have," the lawyer replied.

Bubba put one hand over the mouthpiece and said "You listening, Mike?"

"Yes. Insofar as Stan and Ollie are official representatives of the parliament, they can sign anything you need. Whether or not it will hold up in your courts is questionable, assuming you made the claim that the technology was extraterrestrial. If you make no such claim, there should be no such problem. I can create the required drawings."

Bubba turned back to the phone. "Tell you what, Kirby. Why don't I just put you in touch with the concerned party and let the two of you work it out? I don't want anything out of it, myself; I'm more interested in passing the whole thing along to Greenpeace."

Bubba could hear the distance humming along the phone lines.

"If this is what you say it is, Bubba," said Kirby thoughtfully, "it will mean an incredible change in the lives of practically everyone on the globe. Cheap power—how cheap, I wonder?"

"Hell, you'd be able to walk into a convenience store and buy a year's worth of energy for the price of a case or three of the good stuff, Kirby."

"Unbelievable. And you mentioned an inertialess drive?"

"Yup. The airlines would kill for it."

"What I don't understand is what you want out of this. If you give this to Greenpeace, you'll very likely not get any money, unless you license it outright and collect a royalty."

"Kirby, the only royalty I want is to know that these things will be available to everyone, everywhere. Here, there, third world, all over. I want to know that any rain forest Indian can walk into town and buy one of these for their entire tribe, and not have to worry about being ripped off. I want to know that the designs and drawings are public record, and that the design is free to be copied without restriction. What I don't want is for someone to get hold of it and bury it so it can't be used."

"You don't want much, do you? Well, I'm not sure how it can be done, but I figure that there'll be more lawyers working for us than against us—especially if we offer it to the Have-Nots; if ever there was a case for the zealots and crusaders, this is it. Liberal lawyers will gather like moths to the flame."

"I hope so, because the alternative is uploading the designs to the bulletin boards and spreading it through the networks."

"We may do that, too. It's harder to stop a *fait accompli*, after all."

"I'll have my lawyer call you, maybe you can do lunch," Bubba said.

"I am your lawyer."

"So give yourself a call and take yourself to lunch. I understand you're a sucker for Szechwan."

"Right. I just hope I can get me to pick up the check."

They rang off.

At last, and reluctantly, the aliens

were ready to leave. Kermit took a few more pictures, and Bubba checked to see if the streets were clear. The Sun had not yet quite risen, and there was enough darkness to cover their departure.

Stan and Ollie stood by the platform. Bubba held out his hand to each of them, a custom they seemed unfamiliar with; they, in turn, placed their left hands on Bubba's chest and then touched their own foreheads. They repeated the gesture with Kermit.

"Boys," Bubba said, "It's been somethin'. I've fixed more than my share of flats, and I have to say that this one was the best."

Stan said, "You are good friend to us, Bubba. We will come back soon for more TV and beer."

"Yes," Ollie added. "We must come back to see rest of 'Green Slime.' It reminds us of home."

"Why don't that surprise me? Well, gentlemen, before you take off, I want to give you something to remember us by." He picked up a flat box from the workbench and handed it to Stan. "It's your membership kits for SauNA. Cards, T-shirts, decoder rings, the whole nine yards. Use 'em in good health."

"So long, boys," Kermit said. "Our best to Bigfoot."

The aliens entered their ship, and Bubba opened the big double garage doors. With a slight lurch ("Popped the clutch, I 'spect," Bubba muttered) and the hiss of its powerful fans, the ship moved out the door and into the sky. Within minutes, it was out of sight.

Bubba and Kermit watched it without speaking as long as it was visible, then turned and walked slowly back to the garage. Silently, Bubba opened two Anchor Steams, and they sat at the kitchen table with the screen between them.

"Well, Mike," Kermit said finally. "What do you think?"

"I have no choice but to assume that you've just asked me a rhetorical question. However, I do know what your intention was. I must admit that I'll miss my teammates, and the process of exploration; I have no doubt, though, that within a decade, your planet will be doing its own explorations. In the meantime, I am happy to be able to do something meaningful, rather than the bureaucratic silliness I was forced to perform before."

"Sounds good to me. Bubs," Kermit said, standing and stretching slowly, "I think I'm going to drop this film in my safe, call in sick, and crap out. I am just slightly fried. I'll call you later."

"No prob, Mr. de Frog. Give my apologies to your honeydew."

After Kermit left, Bubba locked up and put the "closed" sign on the front door. Pouring out the rest of his beer, he set some tea brewing, and sat back down at the table.

"Now, Mike, let's think for a minute about that inertialess drive. You think it would be possible to drop one in a '67 Shelby GT body?"

"Yes, Bubba, we could do that," Mike replied. Then, after a short pause, he added, "But it would be wrong."

As static burst from the screen and Bubba laughed, the Sun rose over a new day. ■

# NEWS FROM CYBERSPACE: VR AND HYPERTEXT

I live in Seattle, the city that last fall was host to two major international conferences of interest to science fiction readers: *The Annual International IEEE Symposium on Virtual Reality* and *The 5th ACM Conference on Hypertext.* I was able to attend both conferences, and I'll use this column to provide an overview of what I learned there.

*I. The IEEE Virtual Reality Annual International Symposium (VRAIS-93), Seattle Sheraton Hotel & Towers, September 18-22, 1993.*

Let's start with a definition: Virtual Reality (VR) uses a computer interfaced to the eyes and ears (and perhaps touch and other senses) of the user to create a simulated environment that responds to the user's movements and body motions, creating a verisimilitude of reality. I first wrote an AV column on VR in 1990 ("A Visit to Virtual Seattle," *Analog* 11/90). Since 1990 the field has advanced in technology and also in public visibility. VR has also become a standard staple of science fiction, from the holodeck of STTNG to the many recent VR stories and novels. Video game manufacturers have made tentative VR experiments with 3-D glasses and "power gloves," and VR games are now a staple of video parlors around the world. VR has also been regularly featured in major newspaper and magazine articles, and "new age" figures have adopted VR as a metaphor for their other-worldly musings and pronouncements.

In a sense, VR is a victim of its own hype, for it has come to be quite firmly fixed in public consciousness while still in its technological infancy. Expectations for VR are likely to greatly exceed the technological reality. Simulation of the complexities of the real world with a computer is not easy. It demands computing resources that are near the upper limits of currently available computing power. Today's VR is still limited, tending to be jerky and of limited resolution. It can also produce disorientation and "simulator sickness" nausea in the user. VR simulations, even when not completely successful,

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have taught important lessons about connecting computers to human perception.

The discussions and demonstrations at VRAIS-93 show that the field has reached a new maturity, a new professionalism. As one of the speakers noted, VRAIS-93 was the first conference on Virtual Reality at which Shirley MacLaine would not have been an appropriate keynote speaker. I will select several aspects of VRAIS-93 for particular attention:

- **VR Hardware**—Last year the VPL Corporation, manufacturer of the standard DataGloves and EyePhones of first generation VR, declared bankruptcy, leaving behind a large hole in the availability of human interface VR hardware. At VRAIS-93 there was evidence that several manufacturers are now providing alternatives. Several types of high resolution head-mounted displays and "boom-mounted" displays are now in common use. There are also some interesting alternatives to data gloves, including a "space stick" suspended on force fed-back wires, allowing the user to "feel" virtual objects.

From my point of view, the most interesting commercial VR system was Sun Microsystems' Virtual Holographic Workstation Prototype. Sun demonstrated a standard SPARCstation that had been modified by adding a dedicated graphics board designed to support the heavy computational load of VR. The workstation included StereoGraphics 3-D glasses with liquid crystal lenses to "blank" one of the user's eyes while the other eye viewed the computer display. The glasses used a Logitech ultrasonic positioning system to measure the user's head location and orientation and feed these data back to the workstation. In place of a data glove, the Sun VR workstation supplied a StereoGraphics 3-D Six-Axis Mouse, a mouse with buttons and a pointer that could be used to manipulate objects in the 3-dimensional space viewed by the user. I used the system and was very impressed with its capabilities.

Perhaps the most interesting aspect of the Sun VR workstation was its price. In 1990 when I last wrote about VR, the "entry fee" for a quality VR setup with a full set of VPL human interface gear driven by a couple of Silicon Graphics computers (one for each eye) was about $150,000. The Sun VR workstation, which appears to have superior interface hardware and computing capacity, costs about $15,000. As the entry price comes down, the number of developers of VR will grow very rapidly. A naive extrapolation of the cost curve indicates that quality home-VR is almost upon us.

- **VR Software**—I'll focus here on only one of the many VR software systems discussed at VRAIS-93. The MUSE (*M*ulti-dimensional *U*ser-oriented *S*ynthetic *E*nvironment) system was developed by Dr. Creve Maples and his group at Sandia National Laboratory. MUSE is an open real-time shell designed to provide a hardware-independent programming environment for the development of VR applications. The MUSE demonstrations I saw included a simulated airplane flight over a mountainous pseudo-landscape, a fly-through examination of a medical brain scan, a surrealistic virtual environment created by children in a middle-school class, and an amazing model of the Solar System, with the orbits of planets and their moons re-mapped to logarithmic distance scales. It is clear that broad standards and high-level software tools are needed to provide a common basis for ongoing VR development. MUSE promises to offer these in a freely available form.

• **Other VR Themes**—The presentations at VRAIS-93 spanned a broad range of applications of virtual reality. Let me simply mention a few topics of discussion:

*Aviation*—VR flight simulation; walk-through inspection of aircraft design.

*Chemistry*—Complex organic molecule "matching and fitting" with VR.

*Communications*—business and scientific meetings and conferences in VR space.

*Entertainment*—Theatrical layout and staging, experimental networked VR games.

*Medicine*—the virtual cadaver; VR medical image evaluation, remote diagnosis.

*Physics*—Use of Aristotelian vs. Newtonian mechanics in VR simulations.

*Psychology*—Minimum information required for recognition of faces.

*Teleoperation*—disabled access through VR, space station maintenance.

That's a brief overview of two days of workshops and three days of presentations. I hope it at least communicates the flavor of VRAIS-93.

### *II. The 5th ACM Conference on Hypertext (Hypertext-93), Seattle Sheraton Hotel & Towers, November 14-18, 1993.*

About a month after VRAIS-93 the same downtown Seattle hotel was the site of Hypertext-93. Briefly, hypertext is the computer-based elaboration of normal (linear) text which permits a network of text passages interconnected by "links." The reader can read the text linearly in the usual way or can choose to pursue references, footnotes, and comments through many levels along arbitrary pathways guided by curiosity or the need for more detailed information. Hypertext brings with it new and unfamiliar ways of dealing with information. Many of our ingrained attitudes toward books, authoring, publishing, and information distribution are going to need to be reconsidered in the context of this new information technology. The growing availability of computers with excellent graphical user interfaces and high-bandwidth network connections has transformed the concept of hypertext from a remote ideal to a revolution-in-progress.

There now exist a number of implementations of (or approximations to) hypertext, and these provided an important focus at the conference. These implementations include Apple's *HyperCard*, Eastgate Systems' *StorySpace*, CERN's *WorldWideWeb*, a new and powerful program called *MacWeb* written by a French group, and others. All of these systems were demonstrated and discussed at Hypertext-93, and each had its circle of enthusiasts.

Hypertext as a concept can be traced to the "memex" described in the 1945 writings of Vannevar Bush, but the term "hypertext" was originally defined and brought into sharp focus by Ted Nelson in 1974. In the mid-1980s Nelson and others began Project Xanadu, a visionary attempt backed by $5 million in venture capital to achieve pure Nelsonian hypertext on a commercial scale. Unfortunately the project was terminated by the new management of its sponsor, AutoDesk, last year.

At Hypertext-93 Ted Nelson gave the opening address. It was appropriately inspirational, emphasizing the differences between his vision of hypertext and its current implementations (see above). One important difference between current hypertext systems and Nelson's is that immediate and direct *economic feedback* is a key element of Nelson's hypertext model. The author of a hypertext work (article, review, story, etc.) receives a direct pro-rated royalty payment by electronic funds transfer for each access of every element of his work, perhaps on a byte-by-byte or word-by-word basis. If the author quotes or excerpts another work of hypertext, the royalty payments also chain back to that previous work. (To an author accustomed to months or years of delay between writing and payment, this would certainly be a welcome change.)

A second difference is an emphasis of *transclusion and back-referencing.* Nelson requires a system in which an author can snip out or "transclude" a fragment of another hypertext work (a figure, a table, a paragraph of text) and include it seamlessly in his own work. Such transclusions must be back and forward referenced, so that the reader can follow the reference "backward" to its source, or follow a particular hypertext work "forward" to all the places where it is referenced or transcluded.

Nelson observed that these features need to be included in a true hypertext system. He mentioned his new project, Xanadu Light, which is intended to be a less ambitious and more realizable but full-featured version of the Xanadu system.

The talk elicited questions indicating that Nelson's vision of hypertext may be at odds with that of some of its current practitioners, who questioned the importance and relevance of some of Nelson's features. Nelson said in response to a question that WorldWideWeb looked very promising as an up-and-coming hypertext system, but it lacked back-referencing capabilities (not completely true). On the other hand, he felt that CD ROMs were "pre-Columbian" in that when you tried to go too far with them, you fell off the edge.

One of Nelson's answers was perhaps telling. When asked what hypertext system he used for his own writing, he said that he preferred to use Microsoft Word in its outlining mode. There were murmurs of disbelief from the audience. Was the Guru of Hypertext recommending MS Word?

Incredible! It was as if a leading gourmet chef had admitted a preference for Big Macs.

Hypertext-93 highlighted several communities of interest in the field, so let me list them:

*Reference Books and Manuals*—The immediate growth industry in the hypertext is the generation of linked reference books and manuals (encyclopedias, catalogs, reference manuals, etc.). Much discussion at Hypertext-93 was centered on how best to construct such interlinked documents, and how best to design tools for their generation.

*Automatic Linking*—A related topic concerned the conversion to linked hypertext of previously existing documents. There are now reasonably efficient automatic systems for producing appropriately linked and threaded hypertext from a conventional document or database, but a small percentage of the links will be wrong. Human intervention is still needed

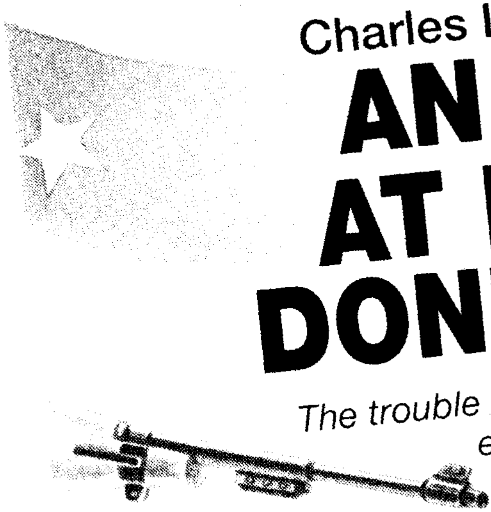
*The Hypertext Fiction Movement*—The HyperCard and StorySpace systems are being actively used by a few avant-garde authors to produce works of fiction. Such nonlinear story-telling provides a unique and interesting set of problems and opportunities. Will you soon be reading this magazine from a computer screen? Not in the immediate future, I'd say.

*Hypertext on Networks*—The Mosaic/WorldWideWeb system (see my AV column in the 3/94 issue of *Analog*) was the "sleeper" at Hypertext-93. There was no mention of this network-based approach to hypertext in the printed proceedings. On the other hand, about one-third of the demonstrations showed WWW systems using Mosaic, and much of the discussion in question sessions and hallway discussions was centered on WWW. It is clear that next year's hypertext conference (to be held in Edinburgh, Scotland) will prominently feature WorldWideWeb.

The processes we perceive in these two conferences are the shaping of technology by visionary ideas and the modification of existing ideas by the constraints, limits and opportunities of technology. This dance of emerging technology will continue, but some convergence is already apparent. One can already achieve a remarkable sense of reality in exploring virtual computer-generated environments. One can already "surf the net" with Mosaic/WorldWideWeb, touring the world on electronic butterfly wings while sipping the information nectar of hundreds of workstation "servers." The joining of VR and Hypertext into some Gibsonian cyberspace does not seem to be happening. But the convergence of technologies that is forming is very important and will change our lives in unimaginable ways. ■

Charles L. Fontenay

# AN M-1 AT FORT DONELSON



*The trouble with nostalgia is that eventually you may have to deal with all your memories. . . .*

*Illustration by Jonathan and Lisa Hunt*

It was a wet winter in north central Tennessee, rainy and chilly in Stewart County, and rivers and branches were on the rise. The day had been mild, almost like spring; there had been a rare winter thunderstorm and just before it quit raining a lightning bolt split the big old oak down by the creek.

The smell of ozone still hung in the air when Jem Hardaway caught sight of the stranger, afoot—on shank's mare, Aunt Jessie called it—plodding through the woodlot toward the house.

Jem, sitting on the white-columned veranda, called over his shoulder: "Rich, bring me my gun."

"Yas suh, *Mistuh Jem," said the* slave, and disappeared into the house.

It might be an unnecessary precaution. There hadn't been any Yankee raiders in this area and the white trash stayed away from Five Oaks. But the word had come down that Fort Henry, twelve miles west, had fallen and Federal scouts might be out.

Jem sat in the wicker-backed chair, rocking gently and looking out at the twilight sky. Jem's grey coat lay across his shoulders against the cold, moist breeze from the southwest. Thin curry-comb clouds skimmed across the sky and black Uncle Jobe, quoting his ancient joints, was predicting snow in the next few days.

The stranger was halfway up the winding road through the woodlot when Rich reappeared with Jem's gun, a three-foot Sharps carbine with iron-bound walnut stock, made by S. C. Robinson in Richmond. It was not a common gun and Jem was fond of it.

Jem saw that the man also carried a musket loosely under his arm but he was not in uniform. A hunter, maybe—but his olive-brown jacket and trousers were clothes such as Jem had never seen.

Jem laid his carbine across his knees and shifted in his rocker, easing the wounded hip. The spotted guineas went pot-racking around the corner of the house as the stranger opened the gate to the front yard, their red-wattled heads jerking back and forth in alarm. He came up the weathered brick walk toward Jem.

The stranger was elderly, maybe sixtyish, wearing a cap of the same *color as his clothes which from its* shape could be either Confederate or Yankee. A tentative smile was on his face and he lifted his free hand in a half-hearted flap of greeting.

"Evenin'," said Jem flatly, shifting the carbine slightly to point in the newcomer's general direction. The man stopped at the foot of the wooden porch steps, looking up at him.

"Hello," said the man. "I'm looking for the way to Fort Donelson."

It wasn't a Yankee accent but it wasn't from around here, either.

"You can go east to the Nashville and Charlotte Road or the other way to Wynn's Ferry Road and turn no'th," said Jem. The man wasn't likely a Yankee scout if he was headed for Donelson. The fort was a Confederate stronghold. "'Bout the same distance either way. But it's four or five miles to Dover. You don't aim to walk it tonight, do you?"

"I don't know what else. I don't have a horse."

"Well, it's gettin' dark for travelin' when you don't know your way. Come up and set a spell, and we'll have us a whiskey."

As the man came up the steps Jem turned and held out the carbine to Rich.

"Rich, hold this firearm for me," he said. Rich could handle the carbine and would react instantly if the stranger made the wrong move. "And holler to Tammie to fix us a pair of hot toddies. Tell her we've got company for supper."

"Thanks," said the stranger. "That's the kind of Southern hospitality I've always heard about. I'm Harry Vick. Harry Maitland Vick. From . . . from Union City."

"Lieutenant Jem Hardaway, C.S.A., Colonel Forrest's Tennessee Cavalry." Jem waved him to another of the wicker-backed rockers. Vick sat down and Jem noticed his shoes: heavy shoes, farm-type shoes, now splashed with mud. Shoes that meant business.

Jem looked at the newcomer's weapon curiously as he laid it on the porch floor beside him, and commented, "Uncommon-lookin' musket. Foreign?"

"Garand M-1," replied the other.

It must be foreign. Jem had never heard the name. Vick picked it up and handed it to him for inspection.

"Breech-loader?" asked Jem, not able to make too much out of the strange mechanism. He handed it back and indicated his Sharps. "Mine is. You get any flashback?"

"Not so you'd notice," replied Vick briefly.

Tammie, a saucy-looking black girl of thirteen, brought their drinks. The two men sat and sipped at the warm whiskey as the twilight deepened.

"What you want to get to Fort Donelson for?" Jem asked. "Sellin' supplies?"

Jem thought he had Vick pegged now: a trader, maybe agent for some company. Maybe the strange breech-loading gun was a sample. Only thing was, it looked like if he was going to offer a new kind of gun to the Army he'd take it up with somebody like General Johnston at Bowling Green, not a subordinate like General Tilghman at Fort Donelson.

Vick evaded the question. Instead of settling back expansively and touting the superiority of his wares, as Jem expected, he countered.

"You say you're a lieutenant," said Vick. "Why aren't you on the line somewhere, with the Federals comin' down through Kentucky?"

"I don't know that they're movin' east from Fort Henry," demurred Jem, sensing criticism. "I'm with Forrest's cavalry and by rights I ought to be at Donelson. I took a minié ball in the hip on a raid. It's not a bad wound but, livin' so close, I came home to heal. I'm due back with my troop at Donelson in a week."

"Too late. It'll be in Union hands," said Vick positively. "Fort Henry fell four days ago."

"So they say. We heard the artillery here."

"Three days from now Grant will move on Fort Donelson with fifteen thousand troops under McClernand, Smith, and Wallace, and he'll take it unless I can get over there and get my job done. If Donelson falls it's the beginning of the end for the South."

Jem stared at him. Vick spoke with the confidence of some general on President Davis's staff with an overall view of the wartime situation.

"Just who are you?" demanded Jem. "How do you know what the Yankees figure on doin'—if you do? And what makes you think fifteen thousand Bluebellies can take a fort like Donelson? There's more Confederates there than that and it takes a five-to-one advantage to capture a strongpoint."

"That's the way it should be," said Vick. "But Floyd will lose his nerve and surrender Donelson. More important than Donelson, if Grant lives he'll win the war for the North."

"Floyd? General Tilghman's in command at Donelson."

"Not any more. Tilghman was captured at Fort Henry. Pillow arrived at Fort Donelson today and Floyd will take over from him four days from now."

Vick took a large, appreciative swig of his toddy, looking thoughtfully out over the yard. It was winter-bare, its flower beds asleep, its trees leafless. A Dominecker hen clucked among the fallen, sodden leaves. Beyond the white picket fence half a dozen horses nosed at what grass they could find in the woodlot.

"Well now, Mistuh Vick," Jem drawled, "I don't reckon you got second sight to prognosticate what Gen'l Floyd or that Yankee Gen'l Grant's goin' to do but, still and all, you do seem to know a lot about troop movements on both sides. I'd like to know how that is."

"Take my word for it, I know what's going to happen here," replied Vick. "The Union general, Grant, is one of the two keys to the fall of Fort Donelson. And if you'll help me get to that area in time, I think I know a way to assassinate Grant."

Corporal Harry Vick was wearing this same uniform, not quite so tight on him, with helmet instead of fatigue cap, as his unit, the Second Battalion of the Rainbow Division's 222nd Infantry, crossed the Rhine on Easter Eve to be greeted by an overly friendly German population. Staring at the welcoming throng, Corporal Jerry McKenneth commented scornfully, "No, not a single Nazi in *that* bunch!"

After that things toughened up and there were heavy battles at Wurzburg and Donauwörth before they conquered Munster and crossed the Lech. Then an escapee from the concentration camp at nearby Dachau stumbled up, crying desperately for aid, and the men of the Second Battalion raced for the camp ahead of their armor, in jeeps and trucks, on bicycles, any way they could get there.

Vick was in one of the few jeeps in which, along with an armored car, General Linden sped ahead of his troops to the camp. Beside Vick bounced Giszczewski, that pig-headed Yankee from Detroit who contended stubbornly about the terrible way black people were treated in the south.

"You don't know what you're talking about," Vick would argue in exasperation. "There's segregation but hell, Giszczewski, all those tales about them being mistreated are Yankee propaganda."

"You can't tell *me*," Giszczewski maintained. "I know. I spent six months in the South once."

Such disputes were still regionally based in those waning days of World War II. To Vick there was no inconsistency that he should feel close comradeship with fellows from Vermont, from Illinois and New York, and yet hold to his passionate conviction that their grandfathers should have lost the War Between the States (if, indeed, they had even fought in it).

"I suppose you've never read *Uncle Tom's Cabin*?" George Lassiter, a PFC from Massachusetts, contributed once to the argument between Vick and Giszczewski.

"Of course I have," said Vick. "A long time ago. To the extent it wasn't abolitionist propaganda it described conditions that undoubtedly occurred but rarely. I'm not a racist and I've no sympathy for the Klan and nuts like that. But the historical fact is that slaves were generally treated well, even with affection. Look at it reasonably, George: a slave-owner wouldn't damage valuable and expensive property."

"That's the whole point," said Lassiter. "Property. Human property. Slavery was an evil that could no longer be condoned."

It was a running argument forgotten as they moved through the poplars outside Dachau and exchanged fire with a few SS defenders. The skirmish was over quickly—the men of the 45th (Thunderbird) Division coming in from the east were the ones who ran into the sharpest fighting.

They approached the main gate by way of the marshaling yard, where trainloads of deportees arrived and departed—and Vick was sickened to see dozens of boxcars filled with piled corpses, from Birkenau.

"God!" muttered Giszczewski in horror. "God, God, God!" He turned away and vomited.

At the Jourhaus, the main gate with its inscription *ARBEIT MACHT FREI*, a tank had to take out the SS guards in a watchtower before they could enter. They were greeted by an SS lieutenant, blond and perfumed, impeccably uniformed, who surrendered the camp with a Nazi salute and a "Heil Hitler!" The major just ahead of Vick spat in the lieutenant's face and growled, "Du Schweinehund!" A few minutes later Vick heard a burst of machine gun fire; he learned later the outraged men of the 45th summarily exterminated the scores of SS guards remaining in the Dachau Konzentrationslager. Even their dogs were shot.

Vick would never forget the aura of horror into which they walked that day in Dachau: the thousands of skeleton-thin prisoners, screaming and yelling in their prison-stripe garb, the mountain of pitiful corpses outside the crematorium, the arched ovens with vault-like doors opening on human ashes . . . the stench of death everywhere.

The memory of Dachau was dulled for Vick over those forty years before he found the opportunity to go back in time, but it did not vanish. It was a memory put to one side because there was no way to cancel its horror.

The gathering darkness converted the two men to mere shadows and Rich, in the background, was invisible. It was getting uncomfortably cold on the veranda. Before Jem could sort out Vick's peculiar response the front door opened and the silhouette of a very large black woman was framed in it.

"Suppuh's on table, Mistuh Jem," she announced.

"Be right there, Aunt Jessie," said Jem, arising. "I reckon you're ready for somethin' to eat, Mr. Vick—and a warm fire."

Rich took charge of both men's guns and Vick followed Jem into the house. It was not a mansion like some in Nashville but it was spacious, with white-columned veranda two stories tall. Jem's folks had lived their lives here and he had been born in the big bedroom upstairs. They passed through the tall-ceilinged hall, past the musty-scented parlor, Tammie preceding them with a lighted candelabrum. When they turned into the dining room, where a fireplace at one end sent out a welcome warmth, Prudence was already there, seated at the foot of the table in a low-cut, hoop-skirted red dress with puffed sleeves. She arose as the two men entered.

"Mr. Vick, this is my second cousin, Prudence Hardaway," Jem introduced them. "My parents are dead and Pru's stayin' here to run the place while I'm away. We'll be married as soon as the South wins this war—I'm guessin' late this year or next."

"Glad to meet you, Miss Hardaway," said Vick and took the seat she indicated halfway down the table between them. "You have a nice place here."

Prudence rang a small bell beside her plate and Aunt Jessie came in from the kitchen.

"Aunt Jessie, you may start serving now," instructed Prudence.

"Miss Hardaway, I wish you and the lieutenant all happiness," said Vick courteously, "but I'd advise you folks not to wait but get married now. This war's going to last into 1865 and times will be hard for the South—if I fail."

"Mr. Vick," Jem informed Prudence, seating himself at the head of the table, "fancies he knows what's goin' to happen, ahead of time. Mr. Vick, that's the second time you've said the South is going to lose the war unless you . . . get to Fort Donelson, I think you're sayin'. Now, sir, I don't like to doubt the prediction—I don't say 'gumption'—of a guest, but I question if any one individual can decide the course of this war."

Vick smiled at him. Slaves brought in the food: fried chicken, potatoes, snap beans canned in jars from the previous summer, spiced peaches, good strawberry wine from last spring.

"Grant is such an individual, who *will* determine the course of the war," Vick said. "Before you dispute my word, think where the South would be now if it weren't for General Lee."

"Lee? He's doin' all right in Virginia but General Albert Sidney Johnston's the military genius of this war," said Jem.

"Johnston's made a mistake about Fort Donelson," replied Vick wryly. "It's mistakes like that that'll lose the Civil War for the South."

"The War for Southern Independence, Mr. Vick," corrected Prudence somewhat stiffly.

Jem was puzzled and a little irritated at Vick's air of absolute certainty about the way things were going to happen. But Vick did seem very sure of his knowledge of Yankee troop movements and it might be wise to listen to what he had to say.

"The South's going to win the war, Mr. Vick," Jem said. "If you're right that we've lost Fort Henry then it's a setback, but even if Donelson should fall—which I doubt—this is only the rim of the Confederacy. Our generals are better'n the Yankees have and we fight for a sacred cause, our freedom, our Southern ideals of chivalry and liberty. The rabble Lincoln's gathered for his armies will get tired of fightin' to put money in the bankers' pockets after a few more defeats like Bull Run. But you've got me curious. What makes you think Donelson's goin' to fall?"

"Accept my premise that I know what I'm talking about," said Vick. "At least till you hear me out. Lieutenant, I was born in the South, my ancestors were Southerners from long before the Civil . . . the War for Southern Independence . . . and I want to change the way things are going to happen and see that the South *does* win the war."

Jem stared at the man.

"By killin' Grant? With that gun of yours?" he asked.

"With that gun."

Jem was impressed by the man's earnestness. He looked down the table at Prudence. There was a mixture of concern and amusement in her blue eyes. Pru was a level-headed young woman. She would make him a right wife.

Pru always brought that song to Jem's mind: *I dream of Jeannie with the light brown hair. . . .*

"As I see it, Mr. Vick, all you're so sure's goin' to happen is just guesswork, because it hasn't been decided yet," he said tolerantly. "Why Fort Donelson, particularly?"

"Fort Henry didn't fall through any failure of Southern arms but because it was built on such low ground the Tennessee River flooded it out and its troops were armed with shotguns and 1812 flintlocks," said Vick. "Donelson's on high ground and strong enough to hold. But when Grant brings his forces against it in the next few days it will fall because of indecision on the part of the Confederate generals there. Nashville and all of western Tennessee will follow."

Vick paused to take out his handkerchief and wipe his brow. With the fire, the room was rather warm.

"Even with Grant deep in northern Mississippi and Lee failing in his invasion of Maryland," he went on, "by the end of next year there's going to be such widespread weariness with the war in the North that so influential a force as the Chicago *Tribune* will urge that a boundary be set by armistice and the Confederacy recognized as an independent nation. If Donelson could hold and western Tennessee be kept, that peace movement could succeed and leave the South free."

Again Jem was impressed in spite of himself. Conquest of West Tennessee? Lee's invasion of Maryland? Vick was pretending to a knowledge of the general military picture that Jem, in active military service, lacked.

"My goodness!" interposed Prudence, almost crossly. "Jem, I wish you gentlemen could find a better subject to discuss than the war, at dinner! I'm tired of hearin' about it."

"Honey, the war's here and it's something we have to live with till it's over, whether we like it or not," said Jem.

He studied Vick's face, down the table. Vick was something past middle age, with short-clipped grey hair, but he appeared in good physical shape for his age. And Jem thought he had Vick figured out now.

Both the North and the South had secret agents all through each other's territory—it was easy, since they shared the same language and basically the same culture. These agents were civilians—spies—but they reported directly to the military and operated under military orders. Vick was evidently a Confederate spy and with Grant's movement southward through Kentucky he had been assigned to gather information on the Union forces' movements and plans.

Through his spy work Vick apparently had discovered this minor general, Grant, was more important than the South realized, indeed was the linchpin of a broad Western strategy by the Union. Vick had been assigned to make his way to Fort Donelson and assure that the fort hold out if possible . . . and he must be a top-flight agent if his assignment included an effort to assassinate Grant, with a special weapon.

They finished dinner and the house servants began clearing away their plates.

"I don't know anything about your gun," said Jem, "but assassinatin' a Yankee general ain't all that simple or I reckon we'd've been doin' it all along. We can talk about it some more after supper. We're pretty informal here, Mr. Vick, and Pru'll join us in the parlor while we have brandy and cigars. Aunt Jessie'll have the house servants fix up one of the sleepin' rooms for you tonight. You can't go on in the cold, a lost stranger in the night."

They had sweet potato pie for dessert, then repaired to the little-used parlor, where another wood fire burned in a wide fireplace, keeping the room pleasantly warm. Rich brought the men peach brandy and cigars, and Tammie served coffee to Prudence.

"Now then, the problem with your plan is, you're not likely to get anywhere close enough to Grant to get a shot at him," Jem opened. "Tarnation, man, if these Yankee generals weren't well guarded in the middle of their outfits don't you think our cavalry'd have picked off a few of them by now? We been tryin'."

"Your cavalry doesn't have advance knowledge of where they're going to be. Six days from now Grant's going to leave his headquarters in front of Fort Donelson to ride downriver and meet with Commodore Foote, who'll have been wounded the day before in an unsuccessful gunboat attack on the fort. There'll be only one orderly with him."

Now that had to be pure fantasy! There was no way Vick could know in advance that a Yankee admiral would be wounded or that Grant would choose to go to a conference with him without adequate protection. It was hard to sift the fire from the smoke in the things Vick said.

"There'll be Yankee troops in the area, if they're plannin' an attack," Jem pointed out.

"The 20th Ohio, moving into position from the river landing. We can be in the woods a good distance from the road and get him. Up to twelve hundred yards away."

"Twelve hun . . . what kind of musket you reckon you've got there, mister? And you said 'we.' "

"You know the country and I need a guide."

Jem squirmed.

"Mr. Vick, you talk like you know a lot about troop movements," he said, "but I don't reckon you know much about actual fightin'. If you turn out to be right and Yankee troops move on Fort Donelson, patrols from both sides are goin' to be out. One thing don't make sense to me in what you just said is that Yankee general'd have to be tetched in the head or drunk to ride out by himself. There'll be Confederate scouts prowlin' through them woods . . . and Yankee scouts too, and some of them could pick *us* off."

"I don't know if he'll be drunk —they say he likes his liquor—but Grant's going to take that risk," said Vick confidently. "I tell you, I *know* that. And I'm willing to take the risk to knock him off—if you'll show me the way up there."

Jem looked him over, swirling the brandy in his glass. It was good peach brandy from his own trees, clear as water.

He considered Vick's request. The man's insistent claim to foreknowledge defied good sense. But Jem was a fighting man and he didn't know much about the spy business. Maybe the Confederacy had such an efficient organization it had an agent on Grant's personal staff and was privy to the way the general operated in intimate detail.

"We-e-ell, I *am* used to striking sudden-like, with Forrest's riders," he decided, "and I got nothin' against turkey-shootin' a Yankee general. I'm prob'ly makin' a mistake but I'll go along with you and see what happens. When you figure on goin'?"

"We have to get up there day after tomorrow and wait for him," said Vick. "Grant and the federal troops will be moving into the area the next day and the way north from here'll be blocked."

"All right, then. We'll rest here tomorrow and give my leg one more day of healin', then we'll get an early start the next day. The ground up there's flooded and the roads're in pretty bad shape."

They said their good nights, Prudence left for her boudoir and Tammie led Vick upstairs to the spare bedroom. In the hall Aunt Jessie was waiting to light the way for Jem, a kerosene lamp in her ample hand.

"Where's Rich, Aunt Jessie?" asked Jem.

"He went out to the bahn, Mistuh Jem," said the old mammy. "He wanted to make sure them triflin' stable nigguhs put yo' horse up right."

"Well, I won't wait up for him. When he comes back you tell him I want him to pack up some things tomorrow for a ride north day after tomorrow, early. I want him to go with me to show Mr. Vick the way to the fort."

Aunt Jessie stuck out a belligerent lower lip.

"You ain't gon' do no such thing, Mistuh Jem," she announced firmly. "The doctor done said you don' go back to soldierin' till next week and you's gonna stay right here and heal that hip like he said."

Jem laughed.

"Aunt Jessie, I'm not the little boy you can order around, not any more," he said. "And you can't tell on me to Miss Vinnie any more when I don't pay attention to you. I'm goin' and I'll be all right. You just see to it Miss Pru doesn't have any trouble keepin' the servants in line while I'm gone. Now let's go upstairs so I can get some sleep."

"Mistuh Jem, Miss Prudence gon' th'ow a fit, you goin' off again so soon when you don' have to," she surrendered with a resigned shake of her head. "But you always was a hard-headed little scalawag. Don' you go off to sleep too quick now, because when Rich gets back I'm aimin' to send him upstairs to rub some warm salve on that hip o' yourn."

Jem was in bed dozing off when Rich appeared to massage his hip with salve. Jem told him what Vick had said and what he had in mind to do. The slave shook his head, his competent hands busy.

"You b'lieve that, Mistuh Jem?" he asked. "That there white man ain't no Suth'n agent. If he's sayin' he knows some Yankee gen'l's gon' ride up that road by hisse'f he's jest tetched in the haid—and if you believes him and goes up there and gets yo'se'f shot by some Yankee in them woods, *you's* tetched in the haid."

Jem chuckled, not taking offense. Jem and the slave had grown up together and there was considerable affection between them. Rich felt privileged to talk straight to him much as Aunt Jessie did.

*O mirabile dictu!* To be in dreamed-of Gilead, and Gilead as sweet and scented as those dreams! Tammie turning down Vick's big four-poster bed, Tammie young and black and alive in her simple homespun frock, was a miracle of substantiality.

He was *in* the Old South, the historic South, in person, in the body. This gracious land! He felt like hugging the little slave girl—but the gesture probably would frighten her, make her think he wanted something of her tonight he didn't.

*Uncle Tom's Cabin*... the thought quivered with scorn. Tammie and Rich and Aunt Jessie were cared for better, were visibly more content, than the jobless and hopeless blacks in the inner cities of his own 20th century.

When Tammie left and he was undressing for bed Vick felt that in a very real sense he was home again. It was so much like his bedroom in the rambling pre-Civil War house during his boyhood in rural West Tennessee. There had been no slave-girl to turn down the covers but the bed with its tall headboard under the fourteen-foot ceiling wasn't too different from this four-poster—and the lights were kerosene lamps, the roads were dirt, automobiles were few and he was seven years old before he saw his first radio.

There was no servile "yassuh, mastuh" and "nawsuh, mastuh" for young Harry Vick from the colored family always ensconced in the cabin across the woodlot to work in the fields. Sometimes when they had rabbit or possum he got to eat supper with them. The black boys of his own age wrestled with him (and usually whipped him) and argued with him over who should get to ride the horse and who was relegated to the mules; the black girls lit on him for inadvertently using the word "nigguh" and his first sex experience was with one of them. Flora, who cooked and kept house, sleeping on a shuck mattress in the little room off the kitchen, fussed at him for not eating a proper breakfast.

But of course racial segregation was strict, and accepted. Despite the informality of his conversation and relations with the black folk on the farm, Harry *was* the young master, and knew it. Reading books like *Two Little Confederates* and *The Klansman*, he was imbued with the viewpoint and values of Southern chivalry by Granny—actually his great grandmother.

Granny had Thurman, their black chauffeur, park the Graham-Paige at the curb in front of Verhine's Department Store, largest in town. Granny liked Mr. Verhine personally and always greeted him pleasantly on the street, sometimes stopping to chat with him. But she made no move to leave the parked car, instead handing Thurman a list of items to buy in the store.

"Why can't we go in, Granny?" asked Harry, who liked to watch the overhead baskets traveling across the store with their orders and their cargoes of merchandise.

"I will never set foot in a Yankee store," replied Granny firmly and righteously.

Granny had lived through "the Wah" and Reconstruction. She remembered the invading Union armies, the burning of once-stately mansions, the ravaged fields, near-starvation, the arrogance and sometimes violence of once-slaves egged on by scalawags and carpetbaggers.

It was largely from Granny's girlhood reminiscences that Harry acquired his image of the Old South as a gracious land, dreaming peacefully amid its fields and forests and streams, its courtly inhabitants served by loyal, polite black slaves who were cared for and appreciated—treated affectionately, as their own black servants usually were. A South of past nobility and abundance, honeysuckle-scented in imagery so intense it was almost memory.

Vick's own boyhood resembled that fancied South of hardly more than half a century earlier closely enough for the vast changes in the American scene that began with the Depression and progressed through World War II to jar on him, offend him. Instead of the quiet fields and woods of the remembered farm there was the crude congestion of the cities; instead of horseback across the fields and the relaxed comfort of majestic trains winding through the countryside there were the impersonal superhighways and the inconvenience of crowded airplanes.

If there were only some way he could restore that dreamed-of South whose expiring edges he once had known . . . somewhere in one of his college history courses he'd come across that information about Grant riding alone up Telegraph Road before the Battle of Fort Donelson.

He hadn't been quite fair to Dr. Edgington, he had to admit to himself. When, taking advantage of his friendship with the scientist, he volunteered for Edgington's first time travel experiment he left the impression he planned to go back only a few years and use the M-1 for hunting in his childhood environment. Instead, once in the machine, he set the dial for early February in 1862.

Now back in the Old South of which he had dreamed, Vick slept well that night in the soft warmth of his eiderdown mattress and his quilted comforter.

They loafed around Five Oaks the next day, Rich and some of the other slaves making preparations for their journey. When Jem told Prudence what he proposed to do she took the side of Rich and Aunt Jessie.

"Jem, you don't know that man," she protested. "He may be leading you into a trap."

"A simple lieutenant?" Jem laughed. "The Yankees wouldn't take the trouble. And if he *does* know where that Yankee general's goin' to be it's too good a chance to pass up."

During the morning Jem gave rein to his curiosity about Vick's weapon. He had seen literally dozens of different kinds of guns among the Southern troops—many of them brought their own from their homes and there were a lot of imports—but Vick's appeared more sophisticated than any he had seen.

"How'd you come by that musket?" asked Jem. "You did say it's foreign, didn't you?"

"I suppose Garand was French, though I don't know," answered Vick. "It's the weapon I used when I fought in a different war. It's .30-caliber."

Vick handed the gun over and Jem fondled it carefully. What had fascinated him from the first was its smooth, sleek shape, so much more graceful than the rifle muskets the soldiers carried, even more so than his Sharps carbine. Now he admired the quality of the steel in the barrel and mechanism. Where the hammer of his Sharps stuck up was a round gadget Vick called a windage knob.

"Thirty-caliber? The line soldier's rifle muskets are .58-caliber," he said. "My Sharps is .52-caliber. You say this has a range of twelve hundred yards?" Four hundred was considered good for the Enfield rifle muskets that were the soldiers' best weapons. "How hard is it to reload?"

"Does it automatically," replied Vick. "Eight cartridges in the magazine. All you have to do is keep pulling the trigger. The operating rod gives trouble sometimes and target shooters have had some problem with the barrel riding up in rapid-fire shooting. It suited me, though."

Automatic reloading. That was hard for Jem to believe, though he knew there'd been a lot of work done toward developing rapid-fire guns and a man named Gatling claimed some success at it. To fire repeatedly without having to reload! If the Confederate command had a source of these for their troops—and maybe Vick's assignment was in part a test of such a weapon—they'd send the Yankees scooting back North in short order! The problem with the rapid-fire experiments had been inaccuracy, due to recoil and inability to aim as fast as the gun fired. The 1861 rifle musket could hit a knothole at a hundred yards in the hands of a good shot.

Jem itched to fire this piece Vick called a "Garand M-1" but Vick wouldn't allow that. He said he had no shells with him except the eight in the magazine. Since Vick wasn't apt to get the chance for more than two or three shots at this Grant, no matter how fast the gun would fire, Jem thought this was being overly cautious. But it was Vick's musket and Jem didn't know what plans Vick might have after completing his objective.

The two men strolled leisurely past the barn and along the edge of a thicket, Jem limping slightly on his wounded leg. In the thicket slaves were cutting and raking underbrush, loading into a mule-drawn wagon.

"Of course if we can bag a Yankee general it's better'n pickin' off a few riflemen," said Jem. "But there have to be other Yankee generals in a force that size, to take over if Grant falls."

"I told you Grant's the key to Northern victory," said Vick. "Smith's the only other general in this force who can fight and he'll be on the left, west of the fort. When Pillow surprises the Federals with an attack from the fort across Indian Creek through Dover, he'll roll up the flank of McClernand's right wing. Only Grant's return from downriver will rally and reorganize the Union troops and turn defeat into victory for them."

Jem shook his head.

"You're predictin' and prognosticatin' like Aunt Jessie does sometimes when the 'sperrit comes on her' as she calls it, drawin' lines in the dust with a stick," he said. "But I reckon you got your orders and I'll guide you up there. If there's goin' to be fightin' at Fort Donelson I ought to rejoin my outfit there a few days early, anyhow."

"I'm hoping we can get into the fort through enemy lines after we've taken care of Grant," said Vick. "You don't have a spare uniform I could wear, do you?"

"Guess one of mine'd fit you well enough, maybe a little tight. I can get Aunt Jessie to let it out if I have to. But why? It won't help you get a bead on Grant and it'll just make you a target for Yankee soldiers if they spot you. Them clothes you got on don't mark you for either side."

"I won't put it on until after we've gotten Grant and start out for the fort. You want to get into the fort to rejoin your outfit but I want to get in for a different reason. I told you Grant's one of the keys to this Union victory. Buckner's the other."

"General Buckner? At Fort Donelson? You're not aimin' to shoot him, are you? I can't let you do that!"

"I don't think that'll be necessary. After smashing McClernand's position and opening the road to Nashville Pillow'll pull back into the fort instead of exploiting the breakthrough. Floyd's in command but Pillow's going to persuade him to sit there until Grant counterattacks and then Floyd will decide on surrender."

"Man, you talk like you can read the thinkin' of all them generals! But that don't make sense," protested Jem. "You wreck an enemy's position and you don't back off and surrender. You keep goin' and drive him back on the Tennessee River."

"Exactly the way Forrest will see it—except he's not in command."

"Well, dawg bite it, Mr. Vick, he *couldn't* be in command!" protested Vick. "He ain't nothin' but a colonel!"

"Too bad he's not a general yet," said Vick. "He will be, and one of the famous ones. At Donelson he'll end up taking his cavalry out of there and riding right through the Union lines to freedom when Floyd and Pillow skip out by boat and leave Buckner to surrender to Grant. I want to pose as a messenger from General Johnston at Bowling Green and fake a message to Floyd putting Buckner in command. Buckner's the junior of the three generals but he's a good enough officer to attack, get around behind the Federal lines and crush them, especially if I can make sure Grant's out of it."

Jem stared at him. Why such a deception? If the High Command wanted Buckner in command, why not just issue the orders openly? Or was this in-service politics, Johnston refusing to ditch Floyd and Pillow, and President Davis's staff in Montgomery choosing this way of getting around him? The different states retained such autonomy in the Confederacy that such was possible.

"You expect to get away with that?" demanded Jem. "I don't know any of these generals but. . . ."

"I'm counting on you to be with me," said Vick. "You're a member of Forrest's outfit, they know you and if I go into the fort with you they won't doubt my claim to be a messenger from Johnston."

"I don't know if I'll go along with you on somethin' like that," said Jem.

"But I'm willin' to take a chance on shootin' Grant if he does show up on that road north."

Jem wrestled in his own mind with the problem of Harry Vick the rest of that day. The man's claim to foreknowledge of Grant's movements and subsequent importance to the Yankee cause was simply preposterous. What concerned Jem was how the Confederate high command could have learned enough of Yankee strategy for Vick—if he was legitimate and not just a crazy man—to predict its troop disposition around Fort Donelson. He felt he was being foolish, embarking on a snipe hunt, but it was true the Yankees were likely to move on Fort Donelson right away after capturing Fort Henry. If the chances of Vick's information being right were anywhere close to even filling an inside straight it was worth the trouble of accompanying him up the road.

That afternoon Jem took Vick with him down the road to Lucas Westford's farm to pick up a pattern for Pru from Mrs. Westford, since he'd be leaving Five Oaks in the morning. Also he wanted to see how well Vick handled himself on a horse, and was pleased that Vick did so quite passably. Some of these civilian agents were city folk who didn't ride horseback too well.

There were no true plantations in this area as in West Tennessee, where cotton was a prominent crop, but the Westford place was considerably larger than Five Oaks and had a large complement of slaves to keep it up. Lucas Westford was in his sixties and hadn't been called into service yet—all four of their sons were in the Confederate Army. Greying and heavily bearded, he was sitting in front of a big fire in the living room, smoking his pipe, when the black houseman let Jem and Vick in.

"Hello there, Uncle Luke," Jem greeted Westford, backing up to the fire. Lucas Westford was not a relative but in the community everybody of the same social level was either "uncle" or "aunt" or "cousin." "How's it comin' along with you?"

"Dern war's messed up the cattle market," Luke responded, shifting in his platform rocker. "Main thing, though, is my rheumatiz, botherin' me in this damp weather. An' that blame overseer of mine, always complainin'. Nothin' but po' white trash. But what else can you get, with a war on?"

"He's new, isn't he?" asked Jem. "Didn't I hear tell you brought him up from Miss'ssippi?"

"No'th o' Vicksburg," confirmed Luke. "Feller named Quince. He's rougher on the darkies than Springer was—but the dam' Army took Springer."

Jem moved to the window and saw what Uncle Luke meant. A half-naked dark-skinned form was bound to a stake just beyond the side yard fence and Quince was wielding a whip with vigor.

"That's a woman he's whippin'," said Jem in some distaste. Slaves were rarely punished at Five Oaks.

Vick moved up beside Jem and continued to stare out the window when Jem went back to the fire.

"High yaller gal I bought last month," said Luke. "Quince says she's sassy. He won't hurt her bad for that—though they say he whupped a coupla smart-lipped darkies to death down in Miss'ssippi." Uncle Luke brooded a moment. "Dammit, Jem, I wish I wasn't so decrepit so I could keep closer check on things goin' on around here!"

"It's the weather, Uncle Luke. You'll feel better when it warms up."

Vick stood at the window watching Quince swing the whip rhythmically against the mulatto girl's already red-striped back and a shiver of revulsion quivered through him. This was the other side of honeysuckle-scented beauty . . . this *was* like *Uncle Tom's Cabin*. He could not hear the cries of the slave under the lash through the window and this far away, but he could imagine them.

Jem was talking with "Uncle Luke" in terms of familiar respect, no hint in his voice of protest or disapproval of what was happening out there. And if that overseer chose, he could whip the girl to death without more than a reprimand. If Luke Westford was one of those benevolent masters on whom Vick hung his vision of the genteel Old South, why did he allow his overseer to perpetrate such cruelty? Why didn't he control the man, chastise him, kick him off the goddamn farm?

If confronted with such a question Westford probably would say, "It's hard to find a good overseer these days. It's the dam' war." Vick was reminded of those friendly, polite Germans just east of the Rhine. No, *they* weren't Nazis, *they* weren't the ones who tortured and slaughtered Jews in the Konzentrationslage, that was the SS troopers. What could *they* do about such things?

Vick put the inadvertent comparison out of his mind and turned back to the cheerful fire in the comfortable, high-ceilinged living room, where Jem was asking, "You reckon I could talk to Aunt Sally, Uncle Luke? She's got a dress pattern Pru wants to borrow."

"Sho'," said Luke and bellowed, "Prissy! Get yo' black hide in here and go fin' Miz Westfo'd for Mistuh Ha'hdaway!"

"What kind of baloney do you folks feed these blacks?" Vick asked Jem when the two men and Rich were on their way out of Five Oaks the following morning. "Last night when Tammie was turning down my bed she asked me if I'd ever seen a Yankee. I told her I hadn't seen any of *these* Yankees and she seemed disappointed. She said she'd heard they had horns and tails like devils and obviously was hoping I could confirm or contradict it for her."

Of course Vick had lied to Tammie. If he was a Confederate agent he must have seen plenty of Yankees, but it was plain he wasn't from around here. That myth was common among the slaves.

"Sho', it's not just the darkies believe those tales about Yankees bein' devils," he told Vick. "Any white child under fourteen or fifteen around here'll tell you the same thing, and maybe some of the grownups too. I'd've believed it myself if the war'd started when I was a scaper."

Jem was right about the condition of the roads: he knew this country and this season. As they came closer to the river, lower-lying stretches of ground were sheets of water with trees and bushes sticking up through it, and the horses slogged along the road in mud up to their fetlocks. Since Vick wanted to bypass the fort and take up a position northwest of it, they went away from the Nashville and Charlotte Road and turned northward on the Wynn's Ferry Road.

The spare Confederate uniform Jem had loaned him was tied in a bundle behind Vick's saddle. The slaves had washed Vick's clothing and Vick was wearing it, with his cap set at a jaunty angle. The two men rode abreast when they could, Rich following on a gaunt bay with most of their gear.

"About that gun, Mr. Vick," said Jem. "You can trust me. I hope this isn't just one gun they're tryin' out with you but that Montgomery has a source of supply. If it's the prime gun you say it is, the army with the best muskets could be the winners in this war, you know."

"Lieutenant, the Confederacy can't get a supply of these M-1s because they haven't been invented yet." Whatever that meant: how could Vick have one if they hadn't been invented yet? "I've been trying to tell you why I think eliminating Grant—and, hopefully, getting Buckner in command at Fort Donelson—is likely to win this war. Try to believe this: Grant's the general Lincoln's going to depend on to win the war and out of all the Union generals he's the one who can do it."

"I've had truck with him," said Jem. "General Polk beat his ears down at Belmont a few months back. That's where I got wounded—I'd been sent as a courier to Logwood's Cavalry when the battle broke. But I never saw Grant. Will you know him if you see him?"

"I will," said Vick grimly.

They didn't have a long ride to reach the vicinity of Fort Donelson but their progress was slow because of the water and muddy roads. At the Robbins house they took the crossroad to the right and about a third of a mile farther on turned left on the Fort Henry Road. About midday they came to the corner of a farm and Jem decided to turn off to the right.

Passing south of the farm they came to a drive, in sight of a white picket fence and a two-story log house with a tall chimney at one end. Through gaps in the trees Fort Donelson was visible a little over a mile away, close enough for them to see some of its Confederate defenders moving around on the earthworks thrown up to the south and west of the fort.

"That's Mrs. Crisp's place," Jem told Vick, indicating they should turn in. "We'll get some dinner here and save our vittles for campin' out."

"Mrs. Crisp? Ah! That'll be Grant's headquarters at Donelson," said Vick, staring at the house with interest.

Jem chuckled.

"Man, you sho' think you know all

the pa'ticulars, don't you?" he remarked. "I reckon General Grant must be pretty smart after all. If he wants good eatin' he couldn't pick on a better headquarters than Mrs. Crisp's place!"

The three of them rode into the yard and, dismounting, tied their horses to a peach tree. They walked across to the house, boots squishing in the water-soaked grass, and Jem hammered on the door. After a moment it opened and the familiar face of Mrs. Crisp looked out at them.

"Jem Hardaway!" she exclaimed. "I'm tickled to see you up and about again, young man. How's the hip?"

"Better, ma'am. Almost well now. I'll be back on duty in a day or two. You reckon we could bother you for a bite to eat before we ride on?"

"Why, surely! Come on in, you and your friend. Your darkie can go around to the back of the house and they'll feed him out of the kitchen."

It was a pleasant and restful interlude after the long, difficult ride, warming their cold, damp trousers in front of Mrs. Crisp's open fire. Vick identified himself as a traveling merchant from Nashville and Jem and Mrs. Crisp talked mostly about family and community matters during the meal.

"Now, Jem, if you're not goin' straight to the fort you be careful," Mrs. Crisp admonished as they prepared to mount and leave. "Some Yankee scouts were seen in these parts this mornin', I hear tell, and the word goin' around is that the Yankees have taken Fort Henry an' are on their way here."

Jem and Vick exchanged glances. Vick was on the money so far.

"They'll be landing reinforcements down the river, about six miles away," Vick said when they rode out of the yard and turned back west. If Vick was right, Grant would stand tomorrow before the fire where they had warmed themselves. "What's the best road up there? The road Grant would take to the steamboat landing?"

"Road we were on," said Jem. "And that one'll be miserable enough, after all this rain. You want a spot where you can be sure somebody on that road'll be stickin' to it? Where Telegraph Road curls around the end of Hickman's Creek. He'd for certain be on the road there."

They headed up Telegraph Road and Jem lapsed into thought. It remained to be seen whether Grant actually did ride up that road into ambush in four days but so far Vick had shown remarkable knowledge of the overall situation and apparently had been right on the likely timing of the Yankee troops' arrival in the area from Fort Henry.

They negotiated the waterlogged road until it curved eastward and Jem announced they had passed Hickman's Creek.

"You seem to know what the Yankees plan to do and you say they'll be movin' into this area this afternoon," Jem said. "How'll they be positionin' their troops? If you know."

"All of them south of the creek, with Smith on the left and McClernand on the right cutting off the road to Nashville," said Vick positively.

"Wallace will come up to fill in the center later. They're coming in two prongs, along this road through the timber and on a more southerly road—I think the one that runs into this one west of Mrs. Crisp's farm."

"Then they'll likely have outriders through the woods on both sides of both roads," said Jem. "Be safer if we go into the woods east of here, direction of the river, so we won't get caught between them."

"Sounds right. We ought to go deep enough into the woods to be sure we'll be safe, for camping out. Grant won't ride up this way almost alone until February 15th, in the morning. So we can take it easy and find a spot the afternoon before that's close enough to the road for a good shot."

Going east from the road for their bivouac, with every step they took deeper into the forest they came that much closer to the swollen Cumberland. There was a swampy backwater north of the fort where Hickman's Creek flowed into the river and this flooded terrain stretched the length of the creek to Telegraph Road. Riding eastward they splashed through some pretty deep water in search of high ground on which they could camp for the next two nights.

"I've hunted this country," said Jem. "There's a little ol' hill farther on where we used to camp out when the creek was up. It's far enough from the road to be safe from Yankee outriders. We'll go there."

Rich knew the way too, and it was he as much as Jem who led them there. The two white men sat down on a log sheltered from the cold wind to have a smoke while Rich began unpacking and organizing for a bivouac.

"This must be a fine place to camp out and hunt when the river's not up," suggested Vick, looking around at the leafless oaks, sweetgums, and hackberry that crowded in around them. "I've seen several deer and a bear off to one side before we reached Mrs. Crisp's house. And there are squirrels all over the place."

"Foxes too, and wolves," said Jem. Probably Vick was a city boy and unfamiliar with backwoods such as this. "Wolves have got a few of the stock now and then but they don't like to come in close to a house. In the woods, though, one thing you have to watch out for is pigs that've got loose and run wild. If you're afoot and you come on a sow, you better get up a tree, fast."

Rich, unpacking saddlebags, chuckled.

"Yas suh, Mistuh Jem," he said. "You 'member that old lady with little 'uns we ran on in the back thicket when we was little scapers? Lawdy, she like to got both of us!"

"I sure do remember that, Rich—and I remember you pushin' me up to the tree fork before you started climbin'."

"I've done some hunting in woods like these," said Vick. "It's this kind of thing the damn Northerners are going to ruin for us with their industry."

Jem never had been north of the Mason-Dixon line, so he wasn't sure how Northern industry entered into the picture. Rather than attempt to pursue the subject, he turned to Rich.

"Rich," he said, "you set up the big tent for the two of us and the little one for you and build a fire between them for cookin' and warmin'."

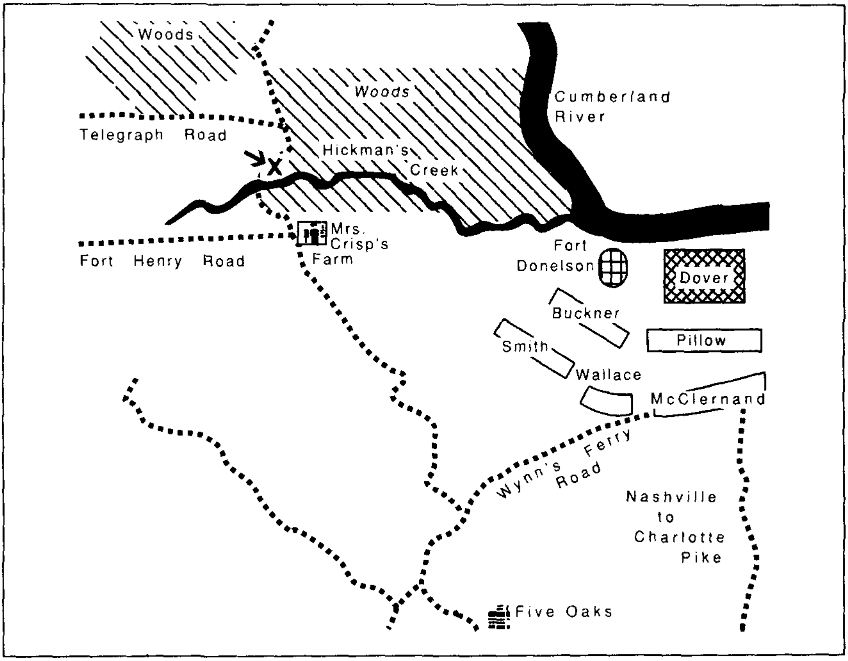
Rich went to work. Vick sat down on a log near the fire with Jem, and with a stick sketched out in the damp dirt what he said were the current conditions—familiar terrain for Jem except for limning in the lineup of Federal troops.

"This is where Smith will have his division, southeast of us across the creek," said Vick, pointing with his stick. "Over here in front of Dover will be McClernand. Lew Wallace will bring up some regiments to attach to Smith's command and fill in the center between them. The X marked by the arrow is where I plan to shoot Grant. One nice thing about this high water is, there won't be any troops northwest of the fort. That's our way in after I've taken care of Grant."

"Maybe you don't know what a flooded backwater's like," said Jem dubiously. "It may be possible but we'll have to leave the horses and pole across to the fort on a raft. They won't fire on two men in Confederate uniform and a slave. Anyhow, if you're right about where the Yankee divisions are positionin' themselves it's the only way we could get in past them."

He glanced around the woods.

"I doubt there'll be scouts from either side sloshin' through this backwater but we better keep a light


Woods
Woods
Cumberland River
Telegraph Road
Hickman's Creek
X
Mrs. Crisp's Farm
Fort Henry Road
Fort Donelson
Dover
Buckner
Pillow
Smith
Wallace
McClernand
Wynn's Ferry Road
Nashville to Charlotte Pike
Five Oaks

watch," he said. "You take it till midnight, Rich, then I'll spell you."

"I'll do my share keeping watch," offered Vick. "It's my project, after all."

"You won't get a fight out of me on that. This leg's botherin' me some after all that ridin' today and I 'spect sleep'll be the best thing for it."

"When you get ready to turn into yo' blankets, Mistuh Jem, you pull yo' britches down so I can rub yo' hip with sa've," said Rich. "Miss Prudence, she had me bring some of that sa've along and I can heat it over the coals to make it feel better."

It was a pleasant night and all of them slept well, with no alarms. After breakfast, Rich took his musket out to see if he could bag a few squirrels nearby—there was some gunfire from the direction of the fort and a few additional shots out here in the water-soaked woods would hardly be noticed under the circumstances. While Rich was gone, Vick pulled a paper from inside his coveralls and held the document out to Jem.

"See if this passes inspection," Vick requested. "I had Tammie bring me pen and paper and wrote it out when we were at your place."

Jem looked it over. In somewhat stilted language it purported to be a message from Gen. Albert Sydney Johnston at Bowling Green, temporarily transferring command of all troops at Fort Donelson from Brig.-Gen. John G. Floyd to Brig.-Gen. Simon B. Buckner, and instructing Buckner to carry out an assault on the surrounding Federal troops "with all dispatch."

"I'm not too well up on written orders," said Jem. "I get mine mostly from my captain hollerin' at me, usually not bein' too polite about it. A courier sometimes in battle but still word of mouth. From the little I've seen, this looks right enough. Of course it's not in General Johnston's handwritin' but I guess generals have aides write out their letters for them a lot of the time. Floyd outranks General Buckner and he might not like it but I'd say he'll obey the order—*if* he accepts it as bein' from General Johnston."

"I'm counting on you being with me when I go in to convince them I'm a legitimate courier," said Vick. "They know you. And with Floyd's indecisiveness I'm betting he'll be happy to turn over command to Buckner in a tough spot. After all, that's what he'll do when he decides to take his Virginia troops out by boat along with Pillow, leaving Buckner to surrender."

"You're askin' me to interfere in a command decision well beyond my rank," equivocated Jem. "If I help you, I'll count on you to protect me from a co't martial if they catch onto the swindle. We've got another day ahead of us to think it over. But don't you think it's goin' pretty far to order General Buckner to attack? General Johnston can't know what the Yankee strength is in front of the fort—he'll barely have heard they're attackin'."

"Generals give orders like that all the time without knowing the situation. Johnston ordered these generals to Donelson in a hurry after Fort Henry fell on the 6th. Buckner just got here yesterday and Floyd himself doesn't get to Donelson till tomorrow. Floyd's under indictment in the Union and afraid of capture but Buckner feels Donelson ought to be held to the last and Forrest's opinion is that the victory-flushed Confederates can drive the Yankees back to the Tennessee River. The way I see it, if the Confederates exploit Pillow's breakthrough the whole army can escape down the road to Nashville to join forces with Johnston. They might even justify Forrest's optimism, swing around behind the Federal lines and defeat the Yankees soundly. If they do that Fort Henry can be recaptured, the Confederate bastion across Kentucky will be restored, and with the loss of Grant's force the way will be open to drive the Union armies back across the Ohio River."

Jem blinked. The man might not know what he was talking about but he had some grand ideas on strategy.

Rich was successful in his hunt. He brought back some small game to supplement their rations. They lolled around in the woods all day without much happening except small arms fire in the distance. But shortly after nine o'clock the next morning the sound of heavy artillery rumbled to their ears from the direction of the fort. After some time it was augmented by the rattle of musketry.

"You're off schedule," Jem accused with a smile. "I thought you said the fightin's not until the day after tomorrow."

"That's when the crucial fighting comes. This today is a duel between the Federal ironclad *Carondelet* under Commander Walke and the fort. The small arms fire is a brigade sent forward by McClernand to try to clear Confederate snipers from a redoubt. Both attacks are due to fail."

There was a lull in the artillery firing around noon, then it resumed and lasted most of the afternoon. They could see nothing of the battle, as they were surrounded by thick trees, but a veil of smoke from the bombardment drifted up into the sky southeast of them.

Vick listened to the sounds of battle, so similar to those he remembered and yet so different in tone, and his thoughts were snared by the history he had read ardently as a boy and a young man. Much more than during World War II he felt the sense of being present at a civilization's struggle for survival . . . the culture of the agrarian South. It was the foreknowledge of what, historically, was to come that imposed on him this feeling.

The comparison arose before him of the long survival effort of ancient Rome. When history spoke of Rome it did not focus so much on the bread and circuses, the decadence of emperors, the gladiators and the crucifixions, as on the noble public buildings, the spreading latifundia, the aqueducts and paved roads, the proud, toga-clad lords of their world. Rome was a centuries-long light of civilization shining in the darkness of worldwide barbarism. A remarkable proportion of Western values and institutions were derived from that ancient Rome.

And the civilization of Rome, too, had been slave-based. Ignoring the natural reaction against Rome of the conquered lands that supplied the slaves, Vick was on solid ground in rejecting any suggestion that the institution of slavery was in any way responsible for the ultimate fall of Rome. Decadent politics, not slavery, destroyed ancient Rome.

Vick's mind ranged ahead to the course of history when he succeeded, as he was bound to, in assassinating Grant and preserving the quiet charm of the prewar South. Without Grant the Northern armies would falter and fail, a peace agreement would leave the Confederacy independent. That was, after all, Vick's aim in being here now. Two nations—and did not the midcontinent have room for both, a noisy, smoky, industrial North and the quiet and courtly South with its polite drawing rooms and singing slaves coming in from the fields at night?

A question that had come up sometime in history classes was that the brains of the widespread Roman world were no less sophisticated than modern brains, its philosophy was as profound and its artisans as clever. Why, then, had Rome and its tributaries failed to develop a more advanced technology? Not the suppressive hand of superstition, the belief in heathen gods: the Renaissance had arisen despite the equally oppressive hand of the mediæval Church.

Here Vick had to admit slavery probably was largely responsible. The authors and orators and philosophers of that day were creative enough but they naturally confined their brilliance to the realms of art and literature, as befitted aristocrats. They would not demean themselves to such sordid concerns as labor-saving machines—the aqueducts, the buildings and the roads were practical and relatively simple exceptions, some of them owed to Greek slaves. Why should the Roman aristocrats bother with such things when slave labor was plentiful and relatively cheap? What patrician was interested in investing thought in ways to make a slave's life less arduous?

It was a lot the same here in the Old South. Industrialism was already on the move in England and in the North. It would continue to progress there, into the 20th century. Within the next decade Prussia would unify Germany and it would plunge into not only the European power competition but the race for technological leadership. But what plantation owner cared to invest in a mechanical harvester when he had Negro slaves who could not only perform that field task but adapt to many other jobs as well?

That was fine. That was what Vick had in mind. Let the North have its factories, let the South stay civilized, if a Southerner needed some technological item it could be imported. The only *caveat* was, how would these separate American nations fare when developing technology shrank the world and it was plunged into multinational war?

In World War I it wouldn't make much difference, whether the Confederacy allied itself with its Northern neighbor or self-righteously refused to get involved. The support of the Allies by the northern United States would be enough to do in exhausted Germany.

But World War II? The two world wars, starting with the traditional confrontation of men and strategy, would turn increasingly on technological competition. What might be the ultimate effect on 20th century political geography of the South's absence from American participation in the technological footrace?

Vick turned his thoughts aside from such considerations to the pleasant prospect of returning to his own time in a changed world in which the agrarian South was an independent nation. The time machine was concealed in a haystack some distance south of Five Oaks, and when he had disposed of Grant and made sure Buckner would defend Fort Donelson he would return to it and vanish from this time. He would pretend to Edgington that he *had* gone back only a few years—maybe he ought to shoot a deer to take back with him as a trophy.

As darkness fell the moderate weather they had enjoyed since meeting at Five Oaks changed abruptly. A wintry north wind arose among the denuded branches of the trees and cold rain began falling. The three of them huddled in the big tent but the wind blew the rain in through the flaps and they were soaked by the time the rain shifted into sleet and snow. Uncle Jobe's prophetic joints were vindicated.

They slept miserably in damp blankets in the grip of a full-fledged blizzard. Their only consolation was that a watch was patently unnecessary, since no one in his right mind would scout through this flooded terrain, either on horseback or afoot, in such weather.

"Since you're after General Grant and you say he won't be ridin' up this way till tomorrow mornin', it's stretchin' it some to camp out in this muddy wilderness for two days," grumbled Jem as they ate breakfast. "We could just as well have got here late this afternoon and set up your ambush in plenty of time."

"Maybe you could, without me," corrected Vick. "I guess your experience with Forrest's cavalry makes you confident of slipping through enemy lines. But I never had to do that—we moved in trucks and jeeps. You saying I was wrong in wanting to come up here a couple of days early, before the Federal troops got here?"

"No, I reckon not," admitted Jem, wondering briefly what Vick meant by "trucks" and "jeeps." "But if I'd known the whole picture I'd've said wait. They probably have supplies and reinforcements moving on those roads between here and Fort Henry but it's not a solid line of troops, just detachments now and then. We couldn'ta come along the roads the way we did but that wouldn'ta been much loss. We could've gone through the woods on the other side of Telegraph Road and I could've sneaked us across the roads clean. But it's too late now so we'll play it on out."

"This isn't too bad, now that it's

daylight and the snow's let up. At least we can keep a fire going now and get warm and partly dry. Can't we?"

They lay around uncomfortably all day. Some time after noon the shelling from the direction of the fort was resumed and Vick said the *Carondelet* had been joined by the ironclads *St. Louis, Louisville* and *Pittsburgh* under the command of Commodore Foote, who would be wounded before the gunboats retired down the river in disorder. There was no accompanying small arms fire in the background this day.

The major thrust of last night's storm was over but the day ended cold and gloomy. Toward evening they were crouching around the fire when a figure appeared silently from the woods. Jem and Rich were on their feet at once, guns ready, but Jem let out his breath in relief at sight of the butternut uniform.

"Sergeant!" exclaimed Jem. "What brings you here?"

"By yo' leave, suh . . . you, suh," replied the newcomer. "Or yo' slave. Slaves do talk among theyse'ves, you know, an' Miz Crisp's slaves knowed you-all was comin' up here. I reckoned with all this high water you'd most likely come to this here rise where we useta camp out when we was huntin' together and I reckoned I ought to make sho' you was all right, you bein' wounded and all."

Jem turned a severe eye on Rich. Rich ducked his head and looked away. He knew he shouldn't have been gossiping about their mission.

Jem turned to Vick.

"Mr. Vick, this is Sergeant Devereaux," he said. "Sergeant French Devereaux of Forrest's cavalry, my unit. Sergeant, how'd you get away from the outfit with Yankees all over the place? Aren't you supposed to be on duty?"

"I'm still on furlough, suh, till nex' week. They may've sent word from the fort callin' me back but I ain't been at the house for the last coupla days. I reckon takin' care of my lieutenant's jest as impo'tant duty as bein' at the fort."

Jem looked at Vick and chuckled.

"I couldn't ask fo' a better bodyguard, Mr. Vick," said Jem. "Devereaux don't miss with that carbine of his. He'd be as apt to pick off that Yankee general as you with yo' fancy musket."

"Well, I don't know," said Vick. "Do you know what Grant looks like, Sergeant?"

"No suh, never laid eyes on no Gen'l Grant."

"*I* know what he looks like, from his pictures," said Vick triumphantly.

The three men settled down around the fire for a chat while Rich prepared supper. A little later as Jem relieved himself against a tree Devereaux sidled up to him.

"Suh," Devereaux said, "what do you think about what that Mistuh Vick was sayin'?"

"About knowin' what's goin' to happen? Sergeant, I don't know what to think. He's been right about things so far but, shucks, he coulda heard about Fort Henry fallin' and be guessin' on the rest of it. I figger him for a Confederate agent sent out here—maybe after Grant, maybe jest to poke aroun' on his own. That way he coulda been told about the way them generals at Donelson are likely to act, but how he could say ahead of time that Yankee admiral's goin' to get wounded and that General Grant's goin' to ride up Telegraph Road alone . . . well, you know I don't believe in the darkies' juju and that kind of thing. We'll just have to wait and see if this Grant does show up."

As they ate supper, enriched by meat from squirrels Rich had shot, Vick said, "Grant's supposed to leave Mrs. Crisp's house right after dawn. I think we need to get up maybe an hour before dawn and find a good spot to get a bead on him when he swings around the end of Hickman's Creek."

Jem and Devereaux looked at each other and Jem winked.

"I'll take the last watch of the night myse'f," decided Jem. "I'm used to havin' to get goin' early and I can trust myself to not doze off better than the most heedful sentry."

"Suh, it ain't necessa'y for you to be up so ea'ly," said Devereaux. "I can take the last watch and get us up in time."

"No, Sergeant, you take the first watch. We're more likely to have visitors early."

True to his word, Jem had them all up, sleepily, while it was still pitch dark and very cold. They gnawed down a light, cold meal and mounted to ride westward, splashing through the flooded terrain.

One advantage of choosing a place at the end of the creek for the ambush was that the waterway created a natural alley through the trees, a clear line of fire for some distance. The creek ran pretty straight along here but even so the woods were so thick they had to settle for a spot about three hundred yards from the target area. So much for the Garand's boasted twelve hundred yard range—but three hundred was enough of a challenge to suit Jem.

"I hope you can recognize your man quick," said Jem. "There's not much space along that road clear to the eye from here, and on horseback he'll pass through it fast, even at a walk—which it'll be on that muddy road. I'd say there'll be time for one good shot, maybe as many as three if that musket can fire as fast as you claim it can."

"I think I can identify Grant from his silhouette," said Vick. "And the gun'll fire faster than you believe. Look, the road makes a bow around to the creek so I'll slip across and go down to the edge of the road on foot. That way I can see him coming well down the road and run back here in time to get set for firing. I'd say either you or Sergeant Devereaux go down and signal when he appears, except neither of you knows Grant by sight."

He dismounted, left his weapon with Jem and waded across the creek, half-swimming part of the way. He vanished quickly into the woods and the others settled themselves to await his return.

"Lieutenant, suh, you're my superior officuh," said Devereaux. "Maybe President Davis sent Mistuh Vick to shoot this gen'l but this strikes me as bein' a fur piece for pickin' off somebody on that there bridge, with all these trees aroun'."

"I've been thinkin' the same. He *says* that repeatin' musket of his is accurate at that range but I haven't seen it fired yet. Maybe he can and maybe he can't."

"Then, suh," said Devereaux, "by the lieutenant's leave I'm thinkin' to slip in about a hund'ed yahds closer where I can get a bead on him with my carbine. Ain't no sense in missin' a chance at a Yankee gen'l—if he does show up—jest to see if that gun of his'n works the way he says it does."

"You go ahead, Sergeant. He can't complain at bein' backed up if he really wants to get Grant."

Vick came thrashing back in a great hurry and splashed back across the stream.

"He's on his way, with one orderly," said Vick.

Devereaux slipped into the bushes with a lift of his hand. Vick looked at Jem questioningly and Jem explained somewhat apologetically, "The sergeant's gettin' in position closer in to the bridge to back you up, suh."

"Think you need some insurance against my shooting, do you? It's all right with me if you're worried about it—but I don't often miss when I can settle in a blind like this."

Vick settled behind a log with the M-1, aiming down the alleyway created by the creek. Union soldiers were slogging southward along Telegraph Road in ragged formations, gaps of varying length intervening between the marching groups.

"It's the 20th Ohio," said Vick without turning his head. "I think they're to be assigned to Wallace's force."

After long minutes two mounted men could be seen spottily through the trees, nearing the bridge as they rode north against the tide of reinforcements.

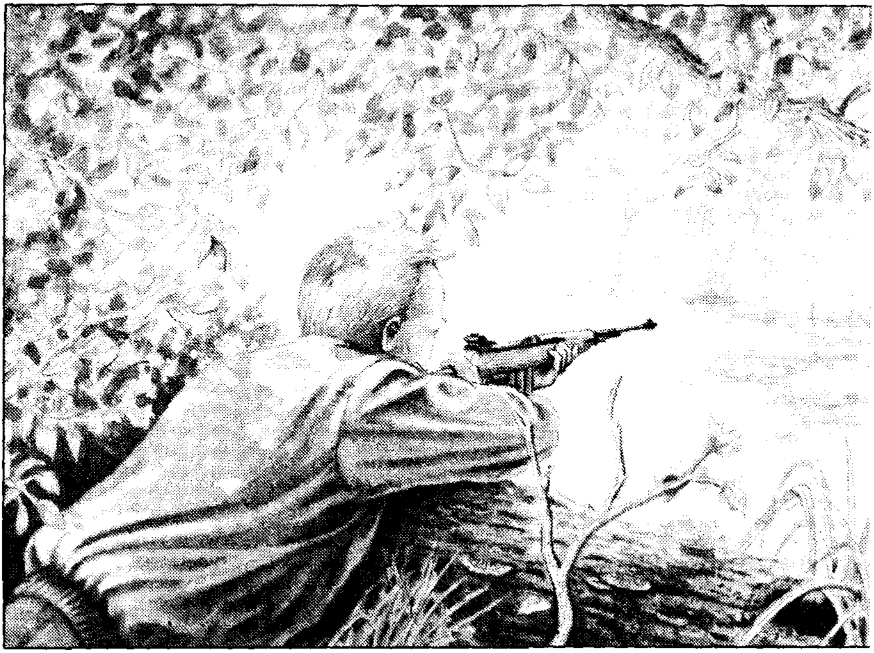
"There he comes!" whispered Vick excitedly. "The one in front, with the cigar!"

Harry Vick was not a scientist and he rarely gave thought to the paradoxes inherent in time travel. When he did, they puzzled and disturbed him. The unexpected twist of the current paradox nagged at his mind.

It was paradox enough that he, a man born in the 20th century, was here now and with a squeeze of the trigger was about to change the course of history. He would kill Grant, the South would win the Civil War and remain an independent nation—but he *remembered* that the North had won and he had fought in a war under the flag of a unified nation. If he succeeded here, what became of the things that *had happened* to him and many, many others?

When he got back to his own time what changes would he find had occurred in his own life? Could he even be sure of meeting Edgington and coming back here in the time machine? And if he didn't, how could this happen that was about to happen, assuring that the South won the Civil War? Or was this fated, in that altered time stream would it be someone else who came back?

He had no doubt about succeeding. He was a good shot with the M-1 at

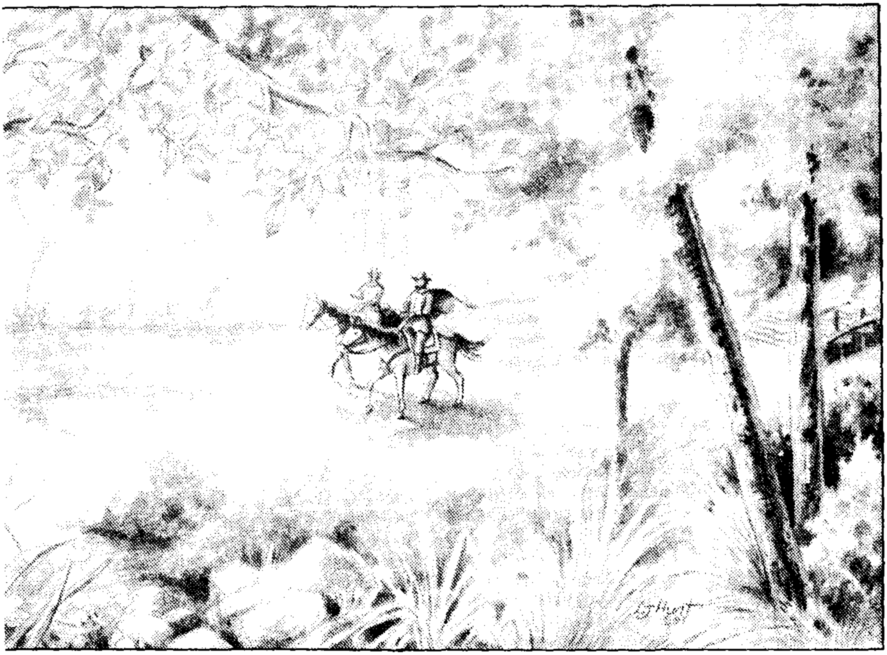


this range and he had eight rounds in the magazine. The twist was that Devereaux, whom Hardaway said was a marksman, was now in a position to make Grant's assassination absolutely sure, even if Vick should unaccountably miss.

What struck Vick as ironic was that Devereaux himself wouldn't be here, in a position to shoot Grant, except for Vick's time travel venture. Devereaux had followed Hardaway up here, to protect his friend and lieutenant, and Hardaway had come only to accompany Vick on his mission. If Vick had stayed put in the 20th century, neither of them would have come here. Part of the paradox.

Waiting tensely for his quarry to emerge onto the bridge, Vick pictured again that chivalrous Southern society he sought to preserve, largely agrarian, with extensive estates and graceful mansions, slow-paced and pleasant. Into that picture intruded another: looking out the window at Luke Westford's farm and watching the overseer, Quince, swing his whip brutally against the back of a golden-skinned woman. That was the other side of that gracious, cultured Old South he treasured . . . and what did it remind him of?

He could not evade it. Slavery *could* be benevolent but when it was not, one exclusive attribute characterized it. The slave had no recourse from the grossest injustice, from torture, rape or death, whether that slave was a Roman captive, a black



servant on an American Southern plantation . . . or a Jew in Nazi Germany.

That too was a part of the life he remembered—and where would it vanish when history was altered? Of course, as in the time line he was about to discard, he would be born and reared in the 20th century South, which might well remain neutral in World War II, like Ireland. Then what would happen to the long treks over rough terrain, the brief, sharp skirmishes, the extended battles with tanks and planes roaring all around him, the corpses in olive drab and German grey sprawled on the ground . . . and that wild ride through the poplars to Dachau and its pitiful inmates?

Would an independent South remain neutral in World War II? And what major difference would it make if a Confederacy still technologically incompetent did join the neighboring North on the side of the Allies?

In the history he remembered the Nazi war machine had almost won before the United States was drawn into the conflict. Even with the support of a fresh and united nation, technologically sophisticated, it had taken the Allies another three and a half years to defeat Adolf Hitler. With the confederacy either neutral or technologically incompetent, the added weight of the curtailed United States could not possibly beef up the Allies to the point of invading Festung Europa.

He hadn't ever thought it all the way through before. Now the picture of the future he had sought became clear: not a gracious agrarian South sharing the land with an industrialized North in a peaceful world, but two second-rate powers isolated behind their oceans while the world was ruled by two tyrannical megapowers, National Socialist Germany and militaristic Japan.

The present caught Vick's waiting eye. Grant rode onto the bridge, into the clear. He was a small man, slumped slightly forward in the saddle, a wide-brimmed hat on his head and his cape whipping in the wind. Behind him rode a slender figure in Union blue, the orderly.

Vick stared at him down the barrel of the M-1. Ulysses S. Grant, in the flesh! The legend he had known only from books. His finger tightened on the trigger.

Devereaux half rose behind a bush, his carbine lowering to get Grant in his sights.

A symbolic image seemed to rise before Vick's eyes: the impeccably uniformed SS lieutenant at Dachau, ignoring the tortured, emaciated *people* behind him to greet his American conquerors with formal military protocol. Blind denial of responsibility for the human consequences of his adherence to the abstraction of a "perfect state."

The stench of Dachau's ovens suddenly in his nostrils, Vick swung the M-1 to his right and fired all eight cartridges in its magazine in a chattering burst. The barrel of Devereaux's carbine jerked up sharply as it discharged into the air and Devereaux crumpled forward into the bush.

Apparently unaware he had been targeted—there was a lot of shooting in the area—Grant and his orderly proceeded across the bridge and vanished behind the trees.

"Dammit all to hell, suh, you shot the *sahgent!"* Jem yelled, so appalled that his natural drawl was exaggerated.

Vick stood up behind his log and took a step backward. The expression on his face was dazed.

"Ah thought you tol' me you could *shoot* that there musket!" Jem snapped, feeling his face turn red.

"Sorry," Vick mumbled. "I guess I made a mistake about things. The South's loss of the Civil War won't destroy it as a civilized society. It'll save it."

Abruptly he tossed away the M-1. It splashed heavily into the turbid waters of Hickman's Creek and sank.

"I've got to get back to my machine!" Vick said distraughtly, and ran off into the woods.

Jem took a step in the direction Vick had taken, his carbine in his hands.

"You goin' after him, Mistuh Jem?" Rich asked.

"No," said Jem reluctantly. "I doubt we could find him and we need to get over there and see how badly hurt Devereaux is."

Together they made their way toward Telegraph Road. Jem didn't have much hope, and rightfully so. Devereaux was dead, hit several times. As Vick had said, he didn't often miss.

"Rich, I guess there ain't nothin' to do now but find a way of gettin' to Donelson," Jem said. "I reckon there'll be fightin' there soon enough."

"Mistuh Jem," said Rich as they headed back for their horses, "you don' think that's really no gen'l they was shootin' at, do you? Hit don' make no sense, suh, a *gen'l* ridin' th'ough hos-tile country with jes' one man to side him."

"I couldn't see from here whether he was a general or not, Rich," Jem said. "Seems like Vick had his facts right on everything else, though. But Lordy! It's plain to me now that Vick fellow was a *No'thun* agent, takin' us all in. Maybe straight out of Washington. The Yankees musta been plannin' this drive and Vick's an advance man sent here to watch out for Grant's safety—though how he or they could know Grant'd decide to ride up Telegraph Road today's somethin' I still can't figure out. But the son-of-a-bitch killed Devereaux, one of the finest men I ever served with."

They moved eastward together through the trees.

"Too bad we couldn'ta turkey-shot us that Yankee general," Jem said, "but anybody with gumption can see no one general makes that much difference in a war. Way I look at it, Vick was talkin' through his hat and Fort Donelson'll hold and send them Yankees scootin' back into Kentucky. Tarnation, Rich, the South's fightin' for a *cause*—and as far as generals go, and fightin' spirit all 'round, why the Confederacy's *bound* to win this war!" ■

For 37 years I've practiced 14 hours a day and now they call me a genius.

Pablo de Sarasate

Perseverance is the most overrated of traits, if it is unaccompanied by talent; beating your head against a wall is more likely to produce a concussion in the head than a hole in the wall.

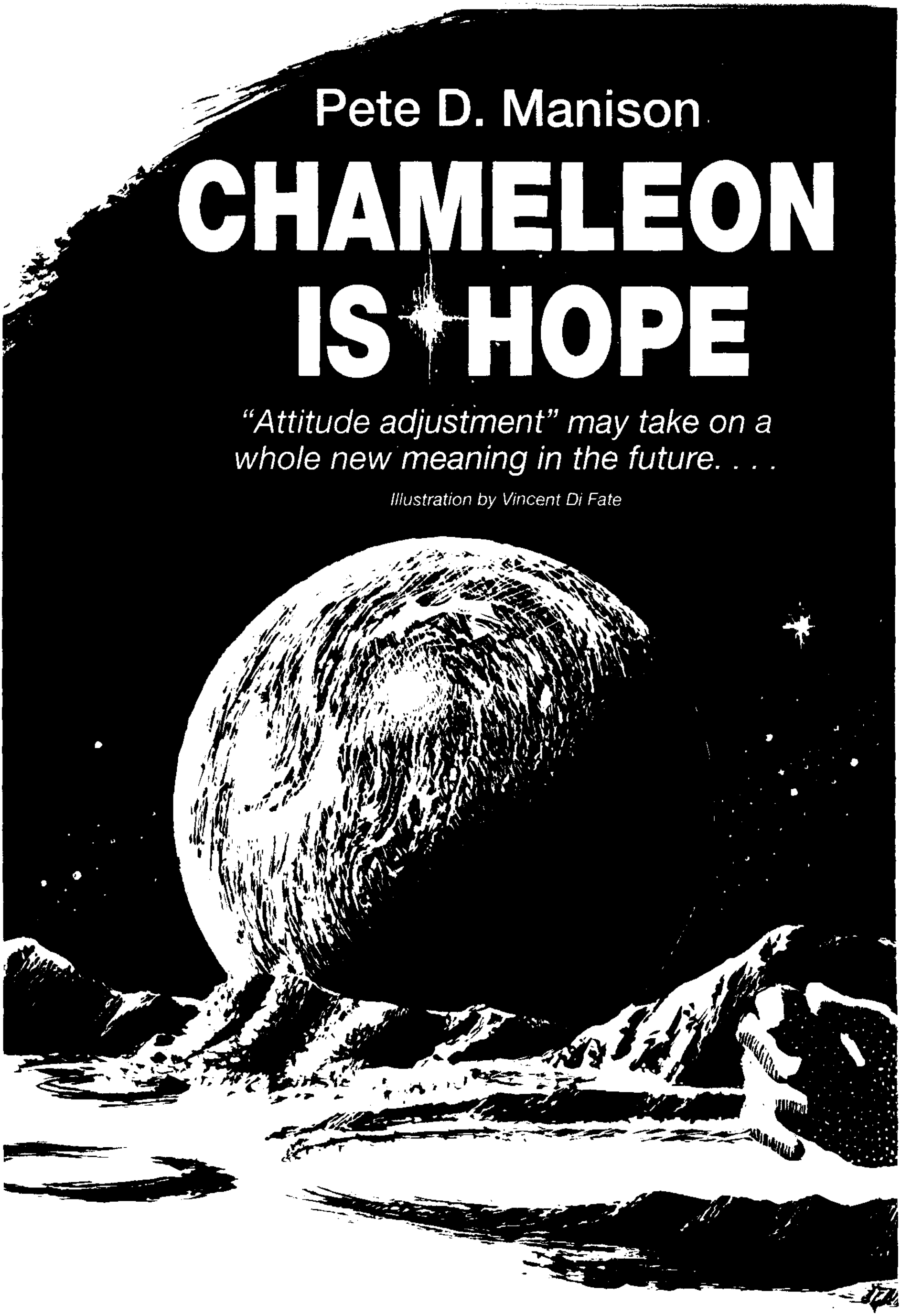
Sydney Harris

Pete D. Manison

# CHAMELEON IS HOPE

*"Attitude adjustment" may take on a whole new meaning in the future. . . .*

*Illustration by Vincent Di Fate*



Chameleon was Dread. Which didn't surprise Mallory, since Chameleon was always Dread for him. Under the circumstances, he thought, perhaps it was best, today, that Chameleon *was* Dread.

"We'll never make it," said Dread. "It's too far. We don't have enough air. We are going to die."

Mallory laughed, the sound going flat inside the helmet of his spacesuit. Behind him, Lunar Defense Complex 3 was a blackened pit in Mare Nubium; a crater so new the dust was still settling, black and scorched, all around the hole, giving the overhead stars a misty shimmer that covered Mallory's suit with black snow whenever he stood still long enough.

And ahead, somewhere ahead, was his only chance for survival.

"Ah, my dear Dread! What adventure, what challenge. This is what living is all about. This is what legends are made of."

Dread groaned.

Mallory replayed the last battle in his mind. The Cascadian invasion fleet was broken, defeated. The last great cruiser swept low over the Moon, its alien pilot desperate or dead, its winged mass turning, dipping. LDC-3 fired its main batteries in desperation. A hit. Another. The cruiser, sliced almost in half, disappeared over the horizon. But not before that great bird gave birth to one tiny, red egg.

The egg was a fission device.

LDC-3 was its target.

Now, Mallory was alone. Alone on all the Moon to celebrate humanity's final victory, a victory bought with blood, but a victory nonetheless.

"I hate people who are happy all the time," said Dread. "I always wonder what they're trying to hide."

Mallory smiled at this, but he didn't answer the voice in his head. Instead, he activated his suit's locator, using precious battery life to get an accurate fix on his destination. There. Air Station Omega. Life. There, just there. Just. . . .

"Thirty-seven kilometers? You must be joking, Mallory."

"We can make it," he told Dread. "We'll travel south first, into the substation grid. The air caches will lead us to the station. There's all the air we need there, and we can contact Earth."

He glanced up at the blue orb as he spoke. Earth, a sapphire on black velvet. So close he could almost reach out and touch it.

"Maybe some Cascadian weapons got through," said Dread. "Maybe there's no one left on Earth to contact."

Mallory laughed. He tried to associate the disembodied voice with the tiny pellet he knew nestled at the base of his brain. As usual, he failed. *Chameleon implants,* he thought. *Artificial intelligence. What a pain in the brain. Just once I'd like to be alone with my thoughts.* "If that were true, Dread, which it isn't, then what productive strategy would you recommend?"

Dread's voice was a cold tickle along the aural receptors of Mallory's brain, as cold as the airless world around them. "Save yourself the burden of hope," he said, "the pain of lingering death. Open your helmet now."

Mallory shivered. "We're wasting time," he said, and he called up the substation grid. Green lines splashed across his visor, virtual vectors that moved as he turned through a complete circle. The nearest substation was less than a kilometer away.

He started walking.

Chameleon was Dread, and Dread didn't take well to having his suggestions ignored. Dread sulked all the way to the substation. Mallory's senses fed on themselves as he moved in bounding leaps along the green line. The lunar soil shifted each time his boots dug in for the next leap, its consistency that of powdered chalk. His breath rasped inside the helmet, in time to the beating pulse in his ears: thud thud rasp, thud thud rasp. He'd set his oxygen mix at MAX-CONSERVE, and the tang of impoverished air burned his nostrils and made his mouth pucker, like biting into a lemon.

He laughed. He was *alive! Think of all the poor slobs who never see beyond the walls of their safe, drab lives. Think of their arteries clogged with sediment and their minds set in thickening molasses and their hopes and dreams all smothered by monotony and routine. I could never live like that,* thought Mallory. *Would never want to. I am exactly where I want to be, doing exactly what I want to do, being exactly who I want to be.*

"Our oxygen supply is half depleted," said Dread, a few minutes later. "Or would an optimist say half full?"

Mallory grinned. "Don't be sarcastic, Dread. You're right: the tank's half empty. But guess what? We'll be filling it momentarily."

Dread sighed, disappointed no doubt. Two minutes later they reached the substation. It was nothing but a white and black checkered cylinder, set half below the surface and half above, about the size of a man. Mallory jacked in, turned two safety knobs on the cylinder, two more on his suit. A faint hiss confirmed his tank was being filled.

He waited.

"So, Dread, we're still alive." He'd taken to teasing the AI implant lately, which was probably cruel, and almost certainly a waste of breath, but he could hardly resist.

"A temporary condition," answered Dread.

"Of course! Death is inevitable one day. And when it comes, I think I shall embrace it, eager to learn what awaits me on the other side."

"Nothing awaits you but oblivion, Mallory. You die, your life's work is forgotten, and you cease to exist. Anything else is a delusion."

Mallory nodded. It was an argument they'd had many times. "I'll be happy however it turns out," he said.

"Probably. That's the depressing part."

The tank was full. Mallory closed both sets of safety valves and jacked out. The green vector on his visor beckoned him onward. He moved out.

The next substation was empty. A micrometeorite impact and a slow leak, it looked like. A frosting of ice on the surrounding rocks confirmed the hypothesis.

"We're finished," observed Dread.

Mallory shook his head. "Not at all. We've got more than enough air to make the next substation. Then only a little farther to Omega." He pictured the air station vividly, its life module small by some standards, spacious after the long hours in the suit. Plenty of air there, plenty of food. Maybe other survivors had made it in ahead of him. Maybe they'd already contacted Earth and gotten a rescue ship dispatched.

Then home. Returning as a hero. The lone survivor of LDC-3, or one of the proud few. Stories to impress the ladies, their eyes big and round in wonder. Then, later, the children, the grandchildren. "What did you do in the war, Grandpa?" "Oh, not much. Just saved the Earth single-handedly is all."

Mallory stopped, giving his legs and back a moment to rest while he took in the stark beauty of the lunar landscape. His coworkers at the defense complex had often complained of "the grays," a state of pseudodepression they claimed was induced by the dreariness of their surroundings. To Mallory, the great sweeping plains and the angular mountains and the sharp divisions between light and shadow had always combined to form new and surprising depths of alien beauty.

"Mallory," asked Dread, "what do you see when you look out there?"

They were halfway between substations now. Mallory thought if he could remove his helmet, the lunar night would be silent and crisp, like the predawn hours of a winter morning back home in Juneau.

"Alaska," he said. "I see Alaska. That's my home, you know. Parts of it are very much like this: rugged, alien, inhospitable. Not a place meant for human beings. But we go where we weren't meant to, don't we? And we thrive there. It's part of our nature. Part of what makes us great."

Dread made a noncommittal grunt. "Alaska," he said. "That figures. It supports my theory, too."

"What theory's that, Dread?"

"My theory that you'd lack any sense of reality at all if not for me. Not that you have much of one now."

Mallory chuckled. "You know something, my friend? They made a mistake when they named you Chameleon. It should have been Antithesis."

"Perhaps. My synapses are fluidic, designed to change as the complement of my host. I give you balance. All of my kind give all of your kind balance. Even less extreme personalities than yours lack balance. An isolated mind is an unhealthy mind."

"I don't know, Dread. *Homo Sapiens* did fine without you for many thousands of years."

"You survived. Somehow. You did not 'do fine.' Before the Joining, all humans were, to one extent or another, insane."

"Insane enough to create you. Maybe you're right."

Dread had no answer for that. He went back to sulking.

They reached the next substation, and it was intact. Mallory dozed off while the tank was filling. He dreamed. In his dream, he saw the gutted Cascadian ship sliding over the lunar horizon. He waited for the shock of impact, but instead he found himself awash in a sea of screaming, panicked voices. The scent of fear was a real thing one had to experience to fully appreciate.

Bodies pressing together, fleeing for airlocks or cover or each other. Desperate cries. Hopeless sobs. Mallory calmly donned a spacesuit, entered the rover bay, and powered up a rover. Voices screamed at him over the radio link. "You're crazy!" "You'll never make it in the open!" "You're safer inside the complex!"

Mallory drove. Overhead, the red egg of death was spiraling in toward the base. There. That crater. Mallory rammed the throttle forward, disengaged the inhibitors when they sensed the uneven terrain ahead. The rover hit the crater rim, vaulted into empty space, then slowly, so slowly, dropped into the crater itself.

Two violent quakes followed. One was the rover crashing into lunar rock on the crater floor, falling to pieces around him. The other was LDC-3 exploding. Searing light, the light of death, flashed overhead. The crater wall, however, shielded Mallory from the worst of it.

It was hopeless, impossible. Only an optimist could have survived.

"Mallory?"

Mallory opened his eyes. He just wanted to sleep. How long had it been now? Traveling in a spacesuit was tiring work. He'd had nothing to eat or drink in hours.

"Tank's full," he said. "Time for the final push. Ready, Dread?"

Dread hesitated. He was probably searching for gloom and doom again, thought Mallory. Then the AI said, "As ready as I'll ever be."

Mallory beamed. "Good old Dread! That's the spirit! We're home free now. Just imagine the azure pools of the air station, the delicacies we'll be served by the nubile nymphs whose only pleasure is to welcome the weary traveler with song and wine and companionship."

"Come off it, Mallory. There's nothing like that in the station."

"Well, of course there isn't. It never hurts to dream. A hot meal and a bed will feel like paradise enough."

"You make me sick."

"Then turn yourself off."

Dread made no further comment as Mallory covered the final distance, humming, then singing as he felt his excitement and energy soar. He'd done it. He'd done the impossible. Again. Sometimes his brilliance astonished even him.

One kilometer now. A ridge blocked his path. It was part of a ray extending from a big crater several clicks to the north and disappearing over the opposite horizon, separating him from the air station, eclipsing it from view. He could search for a fissure or gap in the ridge, but that would take time, and he didn't have time. So he started climbing.

It was slow, exhausting work, even in the Moon's feeble gravity. Sweat fogged his visor. Telltales reported oxygen usage way up. The tank was three-quarters depleted. And then success. He got his hands on the top of the ridge, braced himself, pulled himself up. When he'd gotten his feet under him, he looked down.

At a mass of charred, twisted metal.

"No," he whispered.

But it was true. It was all there, the whole story, written in debris across the airless surface of the Moon. The Cascadian ship had broken into two pieces before impact. One half, the lighter, had sailed on for half a kilometer before gouging a long furrow in the lunar soil and burying itself at the furrow's terminus. The second, heavier fragment had dropped almost straight down out of the sky.

And onto Air Station Omega.

Mallory found himself on the ground, realized that his knees had buckled. He felt cheated, empty, angry and numb all at the same time. That was it, then. All for nothing. The station was gone. His suit air was almost depleted—not even enough to make it back to the last substation. He was going to die. He was really, really going to die.

Reality shifted. How childish he had been! The Universe was a dark, hungry place, his life the hot flicker of a dying candle. All his life he'd spun a web of lies to conceal this reality from his own innocent eyes. Now the web had come unraveled, and he saw it all as it was, as it really *was*, and he wept more at his own foolishness than at the dark wings of death he sensed circling above him.

"You were right, Dread," he sobbed. "You were right all along. My God, what a waste. What a pathetic waste."

Silence.

"And you know the worst part, Dread? We never even found out where they came from. They know where *we* are all right, but we can only live in fear of the night now, always wondering if they might return."

Silence.

"Dread? Talk to me, Dread. I need you now. I need to know that at least I still have you."

Silence.

*Damn,* thought Mallory. *So Dread has won and now he's gloating, won't even talk to me. Fine. Maybe I'll open my helmet and end it all right now. Yes, that is the easiest way. I can't stand living like this.*

Mallory raised his hands toward his suit's neck seals. A voice stopped him.

"No," said Dread, "don't. There's always hope."

Mallory froze. Had he already died? Or just gone crazy? "What did you say?" he whispered.

Dread's voice was gentle, reassuring. "We still have thirty minutes of air. A lot can happen in thirty minutes."

"I don't believe this," said Mallory. "Why are you—" And then it came to him, and he laughed. "I get it. I get it. Chameleon. Antithesis. *Now* you're an optimist. Now that I've given up all hope."

"My synapses are fluidic. I adapt to your changing behavioral and thought patterns, endeavoring to complement your personality, to compensate for your deficiencies. I—"

"You and your fluidic synapses!

Leave me alone! Do you hear? We're dead! Dead, dead, dead. So what's the point?"

"Go down to the wreckage," Chameleon, who was no longer Dread, urged. "There may be oxygen canisters that were not consumed in the explosion."

Tired, so tired. But Mallory got up, feeling pain in every muscle and joint, and climbed down the front of the ridge to the remains of Air Station Omega. At least it would pass the time until. . . .

Desolation. Lovely desolation. It was appealing somehow, like dark comedy or mood art. Mallory moved among the wreckage, taking in the ghastly beauty of destruction, the broken symmetry of a girder rising out of a shattered sublevel, a half-melted control panel dangling from an airlock archway left almost intact, an alien jumble of octagons and rhomboids etched with strange, indecipherable writings.

*I am not the observer of this piece,* Mallory thought. *I am a part of it.* He checked telltales. *Or I will be, in twelve minutes.*

"So much for your theory," he told Chameleon. "No air cylinders here. But it is a fitting graveyard. Just one more tombstone to erect."

"Stop feeling sorry for yourself, Mallory. Turn to the left. A little more. There. What's that?"

Sixty or seventy meters from the edge of the destruction, there was an object. "I don't recognize it," Mallory said, not really trying.

"Exactly," said Chameleon. "Walk us over toward it."

Mallory started to protest. What was he, a puppet on a string to this AI implant? But then he thought: what the hell? It would all be over soon anyway. He thought of his former self, so idealistic, so eager for life. Like a child. A child who never grew up. Just now, he felt no curiosity at all.

"Just like I thought," Chameleon said when they were halfway to the object. "Look at those markings. It's Cascadian."

"So what?" groaned Mallory. "Another piece of debris." But his eyes studied its peculiar, spherical shape as he drew nearer. It was like a giant egg, white as snow, with a transparent slice through one side.

Light streamed out through the slice.

"Mallory, I think—"

His heart was pounding now. Because he saw what the thing was, he saw what was inside it. "My God," he whispered. "So that's what they look like."

The Cascadian appeared unconscious. It was twice the size of a human, with a sort of jointed torso and sinewy arms that looked more like leaf-covered vines than flesh and blood. It had a small, tube-shaped head from which dangled three sets of purplish organs resembling bunches of grapes. Its entire body was bathed in a white light so brilliant it was almost blinding, even through Mallory's tinted visor.

"Is it . . . alive?" Chameleon asked.

Mesmerized, Mallory just stared. Then a red indicator flashed inside his helmet, signaling that his tank was empty and the five-minute emergency air supply had engaged.

*Great,* he thought. *I'm the first human to see the face of my enemy, and now I get to die. Just great.*

"Mallory, I have an idea. Maybe it breathes oxygen."

Mallory snorted. "And maybe it breathes chlorine. What are you proposing?"

"See those octagonal plates beside the transparent slice?"

Mallory nodded.

"They look like controls, don't they?"

"You mean . . . get into that thing with him? You must be out of my mind."

Chameleon ignored the joke. "Quick, Mallory. Time is short. If it breathes air with oxygen in it, you might just survive until rescue arrives."

It occurred to Mallory that Chameleon would survive anyway, its silicon neurons impervious to vacuum or oxygen depletion. This made Mallory very angry.

"All right, damn you."

He began pressing the octagonal plates. They lit up when he touched them, but nothing else happened. He realized it must be some kind of combination. He tried pushing several plates at once. He tried pushing them in different sequences. His air was running out. Then he got lucky.

The transparent slice opened out, and Mallory saw that there were two of them, one inside the other, a kind of airlock. He stepped in, and the floorplate lit up, and the outer slice closed.

The inner one opened.

*I can't believe I'm here,* thought Mallory. The egg was big enough for him and the Cascadian—barely. The creature seemed to be in some kind of hibernation. Or dead. The white light he had observed earlier was radiating down from panels in the ceiling, and he could see wires curling from the panels to a silvery globe embedded in the wall above the Cascadian's head. *Some kind of generator,* he thought. *Photosynthesis. But that would mean—*

"Take off your helmet," said Chameleon.

Mallory felt his heart begin to race. It was against every safety regulation. It was insane. He didn't have time to test this air. There was no telling what it was composed of, what the pressure was, what sort of alien microbes were present.

He felt suddenly drowsy, so very, very drowsy.

"Mallory!" a distant voice called. "Your emergency tank's empty. Open your helmet!"

*Sleep. I just want to sleep.*

"Mallory!"

*Chameleon. Good old Chameleon. You will live, my silicon friend. You are my better half, and you will live.*

Then, somehow, his helmet was off, and his ears were ringing, and his nostrils burned and his eyes watered under that bright, bright light, but his lungs expanded . . . contracted . . . expanded.

His head began to clear.

"You did it," said Chameleon. "I knew you would. I just knew it."

"Oxygen?" Mallory asked.

"Look."

Mallory shielded his eyes from the light and looked at the Cascadian. The purple grapes on the thing's head were changing color now, turning red, then blue. Its "leaves" were changing, too, going from yellow to green. All the while this was happening, Mallory became aware that his breath was coming easier.

"Don't you see?" asked Chameleon. "It's a $CO_2$ breather. It's taking the air you exhale and absorbing the carbon dioxide and giving off oxygen."

Mallory blinked. "But is that *possible?* No single plant could—"

"This isn't an Earth species, Mallory. From the light input it's absorbing, I'd estimate its metabolic rate at something comparable to your own. Once you reach equilibrium, the two of you could sustain each other indefinitely."

*Great,* thought Mallory. *Just great. My enemy—humanity's enemy. The thing that did this to us, that almost did so much more.* Red rage swelled inside his chest. *Kill the invader! Kill!*

He looked the alien over. Not much, up close. Thin, weak, unconscious and vulnerable. It looked like it might be injured: some of the "vines" on its lower torso had been torn out, detached, and were withering. It would be so easy to finish the job.

"Don't be a fool, Mallory. He's recycling your air. Kill him, and you die with him."

Mallory closed his eyes against the rage, the race-hatred, the instinct for revenge. Chameleon was right. Kill it, and he would be killing himself. But . . . did he care enough about himself not to?

"You made it, Mallory. You were right all along. You're safe now. As long as our friend here keeps breathing, we should be able to survive for days. And this will be the first place the rescuers come when they find no survivors at LDC-3."

Noise. Noise in his head. Damn the noise. Damn it all, anyway. *Who cares?* Mallory shook his head. *Who cares if I live or die? What does it matter? It's only me.*

Then he looked up again, stared at the Cascadian. Arrogant butchers! They'd come without warning, bold and brutal, their aim the total conquest of Earthspace. Only the Lunar Defense Complexes had stopped them. And at such a cost. . . .

Mallory felt the anger maturing inside him. They'd failed . . . *this time.* But what if they tried again? He squinted. The light in here could be the finish of his retinas, but it gave him an idea. The Cascadian might require light similar to that of its native sun. Light could be analyzed, broken down into a spectrum, compared to the spectra of various nearby stars.

*We could find their home world,* Mallory thought excitedly. *At last, we could learn their point of origin.* Sure, it was a long shot. Humans used incandescent light sources whose spectra were closer to a red dwarf's than to Sol's. But then, human beings didn't live by photosynthesis. And even if it *was* a long shot, it was better than nothing. It was a beginning.

Mallory felt the idea changing him. Suddenly he realized he had to survive, no matter the cost. He had to be there, tomorrow and the day after, to help in what small way he could.

"All right, Chameleon. We'll play it your way. I'll be damned if I'll die out here, like this, after what I've been through. Hell, the worst part's behind us, right? We haven't come this far to lose it all now."

Chameleon was silent.

"Chameleon? I said—" And he understood. The switch. Like before. The period of silence, the gap while the change took place.

"Chameleon," Mallory said, "listen to me very carefully. We are going to live. You've convinced me. And you're still the optimist. Your fluidic synapses are trying to change, but that takes a minute or two, doesn't it? Don't let it happen. You've seen how bright the world can be, how positive thought can overcome almost any obstacle. You don't want to go back to being Dread."

Silence.

"And you don't have to. Believe in yourself. You are the pinnacle of artificial intelligence. You're a marvel. You can reprogram yourself at will. You can become the opposite of your host, the mirror image. But you don't *have* to become that. You can make a choice to become more. You can become whole."

Mallory waited, listening for that inner voice. He could be here a long time before they found him. He could go crazy if Dread returned, filling his mind with paranoid suspicions of flesh-eating plants and deadly airborne viruses. He could freak out and do something stupid. This wasn't pessimism; it was simply reality. Something he'd learned was neither white nor black but every shade in between.

He didn't want to die.

So he waited.

And, presently, Chameleon spoke.

"Thank you," was what Chameleon said. "Thank you, Mallory, so very, very much."

Two days later, a star was moving among the other stars in the lunar sky. The Cascadian hadn't awakened, but its respiration had continued, keeping Mallory alive if somewhat lethargic. The $CO_2$ content of the air was a little higher than he would have liked, but he was sure it would cause no permanent damage. His sunburned face was a greater irritant; it had been inevitable despite his best attempts to shield himself from the Cascadian's life-giving light.

"Do you see it, Chameleon?"

Chameleon said yes.

Mallory considered. It could be an asteroid or a piece of space junk or even a Cascadian ship. He had no right to assume it was rescue. But he knew it probably was.

And Chameleon? Chameleon shared these doubts and a thousand others, but he kept them to himself. It would do Mallory no good to hear them now. And Mallory's welfare, now and always, remained Chameleon's only concern.

*My greatest patient,* Chameleon thought. *My greatest success.*

Mallory had made progress, and he'd brought Chameleon with him. Nothing must undo that work. So Chameleon buried his doubts, buried them deep, and when he looked out again through Mallory's eyes, he *knew* that moving point of light was an Earth ship. And he knew that the landscape need never again look quite so forbidding or inhospitable—whether it was the landscape of Alaska or the Moon or even the landscape of the soul.

Chameleon had no doubts at all.

Chameleon was Hope. ■

# IN TIMES TO COME

Back in March of 1977, *Analog* published a novella called "Stardance," by Spider and Jeanne Robinson. Then-editor Ben Bova reported that "Stardance" received more reader mail than any other story published that year, as well as winning not only our own AnLab poll but both the Hugo and Nebula Awards for Best Novella. It also opened up a vision of the not-so-distant future so expansive that it couldn't be confined to a single novella, or even the novel that it soon grew into. Next month the Robinsons return to *Analog* with the four-part serial *Starmind.* If you read the earlier stories, you'll appreciate this one as the culmination of the stardance epic. If you didn't, read *Starmind* anyway: it's quite capable of standing on its own and satisfying with its own mind-stretching merits.

Next month also marks the 100th anniversary, by at least one reckoning (the story has a rather complicated history preceding the 1895 novel version), of H. G. Wells's "The Time Machine." Charles L. Harness marks the occasion with a new novelette, "1894," in which Wells himself figures prominently.

Rounding out our August issue will be stories by Hayford Peirce, Joseph H. Delaney, and Sarah Zettel—plus a fact article by Robert Zubrin on "How to Find a Starship." It may well be that they're out there, but we haven't been looking for them the right way. . . .

# ANALYTICAL LABORATORY RESULTS

Thanks again to all who voted in our annual poll on the previous year's issues—your most meaningful way to convey appreciation and positive reinforcement to the authors and artists who do an especially good job of entertaining you. Your votes help you by giving us a better idea of what to offer you in the future. And they help your favorite writers and artists by rewarding them directly and concretely for outstanding work.

We have four categories: novellas and novelettes (combined into a single class), short stories, fact articles, and covers. In each group, we asked you to list your three favorite items, in descending order of preference. Each first place vote counts as three points, second place two, and third place one. The total number of points for each item is divided by the maximum it could have received (if everyone had ranked it #1) and multiplied by 10. The result is the score listed below, on a scale of 0 (nobody voted for it) to 10 (everybody ranked it first). In practice, scores run lower in categories with many entries than in those with only a few. For comparison, the number in parentheses at the head of each category is the score every item would have received had all been equally popular.

## NOVELLAS AND NOVELETTES (0.53)

1. "Into the Miranda Rift," G. David Nordley (1.82)
2. "Young Again," Jeffery D. Kooistra (1.52)
3. "The Carhart Shale," Grant Callin (1.41)
4. "With Time Comes Concord," Duncan Lunan (1.11)
5. "Down In the Bottomlands," Harry Turtledove (1.09)

## SHORT STORIES (0.57)

1. "White Room," Stephen L. Burns (2.45)
2. "Puff," Jeffery D. Kooistra (1.47)
3. "Spcpt. Vu," Jeffery D. Kooistra (1.27)
4. "Defend with the Utmost Endeavor," Kent Patterson (1.19)
5. (tie) "Jake's Gift," Bud Sparhawk (1.16)
   "From the Corner of the Eye," Michael F. Flynn (1.16)

## FACT ARTICLES (1.54)

1. "Single Stage to Infinity!," Dr. Arlan Andrews, Sr. (2.71)
2. "FAT-Eating Logic Bombs and the Vampire Worm," Edward Rietman and Michael F. Flynn (2.57)
3. "Comes the Revolution. . . . ," G. Harry Stine (2.23)
4. "Goat Island," L. Sprague de Camp (1.95)
5. "Is AIDS an Autoimmune Disease?," Dr. J. Kevin Steele (1.92)

## COVERS (1.54)

1. October (for "The Carhart Shale"): John Maggard (3.13)
2. July (for "The Man Who Stayed Behind"): Stephen Youell (2.73)
3. June: Bob Eggleton (1.90)
4. August: Bob Eggleton (1.87)
5. (tie) May: Jim Burns (1.55)
   December (for "Young Again"): Jim Burns (1.55)

The clearest winner this year is in the short story category, while in the others competition was pretty tight even at the top. G. David Nordley's novella/novelette win makes two in a row. Jeffery D. Kooistra has apparently struck quite a chord with *Analog* readers: his first story, "Love Dad," won the short story award last year; this year he captured a strong second among novellas and novelettes, and both second and third in short stories.

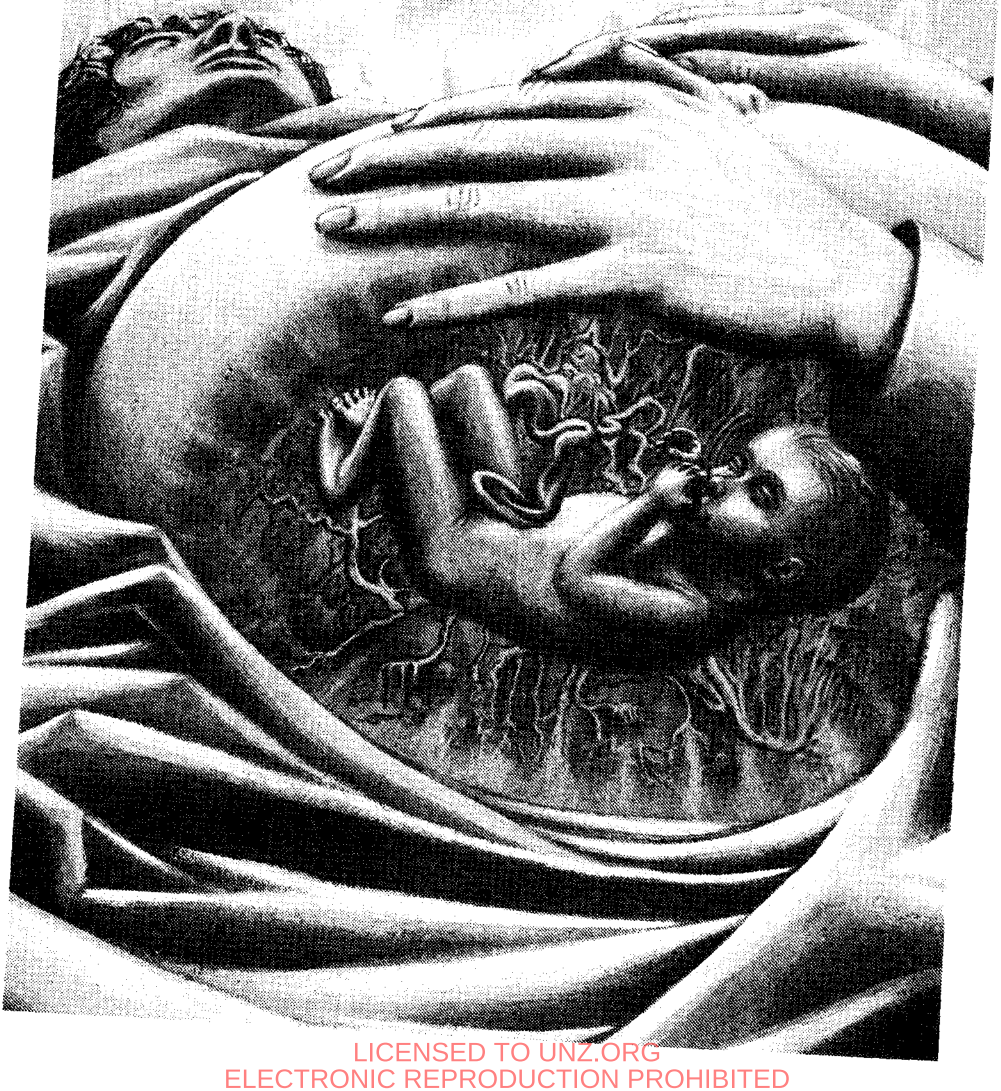
Jeffery Hukkanen, of Whittier, California, is this year's winner of a free one-year subscription in a random drawing from all ballots received. Next year that could be you—and the more votes we have, the more the results mean!

G. David Nordley
& H. G. Stratmann

# TIN ANGEL

*When does a tool become a colleague?*

*Illustration by Alan M. Clark*



They both heard the sirens.

Angel's eyes went wide. "Automobile accident, drunk driver uninjured in custody, man dead at the scene, pregnant woman, coming here, possible internal injuries, unconscious."

Dr. C. Thornhart Benson looked sharply at his new protégée, momentarily surprised. She grinned and pointed a finger to her eyes. He smiled in spite of himself. Her eyes were infrared as well as optical receivers, and she was, of course, linked into every digital device in the hospital, including the comm net. He wouldn't have to wait for the call. Too bad about whoever it was, but this was an opportunity to see what Angel could do.

"Let's do it," he said. They had been about to leave his stuffy, cluttered third-floor office at the medical center after a few minutes of paperwork and decompression following evening rounds on his patients. Instead, he put down his journal, Angel put down a half-finished stocking cap she was knitting, and they headed toward the emergency room.

He wanted to be there when the patient came in, not only to do what he could to help, but also to see how Angel would handle the situation. If the experiment called Angel was to work, she'd have to learn this side of the business.

The wail of sirens faded as the ambulance approached the hospital. Why, he wondered, did they still let people drive precybernetic cars? Inevitably, some of them did it drunk.

"That ambulance knows its business, Angel," he remarked as they left the elevator for the first subfloor. "No need to wake everyone; the siren's done its job once the ambulance hits the emergency room driveway."

Angel nodded with such a human look of concern on her face that he had to remind himself that she wasn't even alive in the usual sense. Her repertoire of appropriate verbal and nonverbal patterns of communication was extensive but, he knew, required only an insignificant part of the optical core memory stored in her chest.

Approximately where her heart would be, he realized.

They could "can" diagnostics, anatomy, and pharmacology in a database and drop it into her brain, but experience was something else; a collection of someone else's anecdotes just wasn't good enough; too much missing. So the Artificial Intelligence Consortium that made her decided she should have an internship just like any other doctor. Of course, one of his long-time patients was part of the consortium, and when they'd needed an advisor to teach their creation the human side of medicine, they'd talked him into it.

They'd made her bright, cheerful, tireless, and innocent. He was a childless widower. It had been pretty much a case of love at first sight. Hell, he thought, he'd fallen in love with cars, an airplane, even the great old oak desk his grandfather had left him. So, his attachment to Angel had been completely predictable.

They reached the entrance to the emergency room, and he held one of the heavy swinging doors open for her.

"Well, let's go."

"I'll follow you, Dr. Benson." She winked and tossed her head, sun-touched platinum polymer threads cascading around perfect shoulders. "Age before beauty."

"Hrrmph!" He went through the door first, grinning in spite of himself.

He nodded to the ER physician, a moonlighting dermatology resident who'd been only too happy to let Benson take over a major trauma case as he and Angel charged into the prep room, stripped to shorts and T-shirts, and shrugged into scrub suits. Then it was out to the ambulance entrance to wait for the stretcher. The woman's vitals were already displayed on the high-res overhead. Shock.

"Probably hypovolemic," Angel said, her voice full of concern. "Nearly two liters of Ringer's lactate in her . . . starting to stabilize." She frowned. "Thorny, I'd better tell you this now. It's Linda Coombs."

"Oh, God!" Thorny winced and shut his eyes. He'd saved her life once before, twenty-five years ago, when she'd almost strangled on her own umbilical cord in one of the more difficult deliveries a G.P. ever got to do these days—by virtue of his being in her parents' living room when she made her somewhat early entrance into this world. This meant Terry was dead, he realized. He'd been at their wedding just last year. Good kid, ran his own security service. . . .

Angel's hand was on his arm. "Are you . . . ?"

"I'll be fine. Thanks for telling me now. Better than recognizing her on the stretcher."

As he spoke the doors slid open and things became a blur. He and Angel followed behind as the stretcher drove itself into the trauma room with its silent burden, and paramedics hovering around like ghostly bees around a red flower. Linda's nose and mouth were covered by an oxygen mask, and a cervical collar encircled her neck. A blood-stained white sheet partially covered her limp body, which was connected at multiple puncture sites to bags of intravenous fluids hung on tall poles. The portable heart monitor, connected by multicolored wires to electrode patches stuck onto her exposed chest, beeped in a disturbingly fast and irregular rhythm. Thorny motioned to the scanning table, and they slid her onto it, tubes and poles following in an orderly ritual that only looked like mass confusion.

Thorny still found it hard to believe this was the same exuberant, vivacious young woman he'd last seen in his office not quite a week ago.

Forcing himself into objectivity, he watched Angel do a quick visual examination for external injuries. Linda's chest was bruised, with some swelling above her left breast, and she had a golf-ball sized lump in the middle of her forehead.

"Beginning scan." Angel said, and the bistatic resonance sensor head beneath the table glided to the top of Linda's head and began to move slowly down the length of her body. As the imager started its examination, Angel resumed hers.

"Pupils equal, round, and reactive. No blood in the ears or nose." She continued while one of the ER nurses—Sarah Miles, a robust, almost angrily competent black woman who Thorny knew slightly—drew blood for the analyzer.

"Type AB negative," Angel announced. "The blood bank has it—it's on its way."

The nurse shot a quick look at Thorny as she prepared to do a twelve-lead electrocardiogram, and her eyes widened a bit when he nodded. "How the—?"

Thorny held up a hand. "Later. Let's get those electrodes on." He'd been assured that the medical center staff had been briefed about Angel, but seeing her in action was, it seemed, something else.

The imaging camera stopped abruptly at the level of Linda's shoulders. "No fractures or bleeding," Angel declared. "We can take off the collar."

Now it was Thorny's turn to stare. Angel smiled and the holoscreen monitor above the table snapped on. Thorny noted the image was blue tinged—probably the blue laser power setting, since the ultra-high res screen with the interference patterns was digital. The unit was a bargain when the center got it ten years ago, although it was bulky and hard to maintain by current standards, but it beat the hell out of what he'd had when he started in practice. In rapid sequence standard views of the skull and cervical spine appeared, rotated 360 degrees, and were replaced by images of the brain. Of course, he realized, Angel controlled its operation through her optical interface. For that matter, the images she showed would be strictly for the benefit of the human staff.

The imager resumed its slow path down Linda's body and Angel moved her hands quickly over Linda's pregnancy. The tiny sensors and transducers in her fingers and palms could, Thorny remembered, sense pressure through ultrasound and electrical fields through microwaves.

"No fractures or bleeding," she repeated, "except—." Her hands caressed the abdomen once more. "The placenta has partially separated, and there's some intrauterine bleeding. The size of the fetus is consistent with a gestation period of 34 weeks." She paused, then looked at Thorny. "I'm sorry. No fetal heart beat or cerebral activity."

Thorny felt a brief pressure in his own chest. Even though they were too late to save her baby, Linda still had a chance. Needing to do something to restore his clinical detachment, he glanced up at the overhead monitor. "Her blood pressure is—"

"—Eighty-five over fifty." Angel completed his sentence without looking up. Thorny winced; he'd forgotten.

Angel's fingers brushed across Linda's chest. "No pneumothorax or any significant bleeding—mildly depressed sternal fracture—the left fifth, sixth, and seventh ribs are broken. The aorta seems intact. Her heart—" Suddenly Angel froze; utterly, inhumanly, motionless.

For a heart-rending second, Thorny

thought she had malfunctioned, and realized that he might have to lift her out of the way, somehow, and take over.

But she started speaking again, her mouth moving while the rest of her body remained eerily rigid. "Her left ventricular function is very poor. I'm not sure how to explain that."

Thorny sighed in relief, and remembered how often he'd told her; "When in doubt, don't just do something, *stand there.*" Apparently, she'd taken that literally. He shook his head, pushed his attention back to the patient, and wrinkled his forehead.

"I'm not sure either. Her grandmother died of heart failure at sixty, and her mother at forty-two, though that was complicated by smoking. But Linda never had any signs of a heart problem. I—"

Suddenly, Angel was a blur of motion.

"She's in v-fib!" Nurse Miles shouted. "No pulse!"

Even before the sentence was completed Angel had grabbed the defibrillator paddles, and charged the machine.

"Clear!" Angel ordered, and everyone obeyed instantly. Chalk one up for a humanoid robot, Thorny thought; people might have hesitated if something that was obviously a machine had issued that order.

Angel delivered the electrical shock to Linda's chest. Thorny peered anxiously at the heart monitor—and exhaled thankfully as it started beeping again. Nurse Miles pressed her index and middle fingers against Linda's neck, and smiled slightly. "Good pulse."

Speaking for their benefit, Angel ordered an intravenous bolus and drip of Cardiopax. The IV unit chimed in response before she finished saying "bolus."

As Angel still held the defibrillator paddles, Thorny placed a tube down Linda's throat to help her breathe and made sure it was positioned properly. He started to ask Nurse Miles to connect it to the ventilator when—

"Clear!" Angel shouted, signifying that Linda's heart had stopped again.

Once, twice, three times—finally her heart started beating again, but now her blood pressure was dangerously low. They were losing her, Thorny thought, there was no time to. . . .

But before he had a chance to speak, Angel brushed the nurse aside as the cart containing the cardiopulmonary support pump scooted over to the table. Moving so fast her hands seemed blurred, Angel prepped Linda's right groin and then, more deliberately, threaded the catheters.

"Right atrium," Angel announced, then "proximal aorta." As Thorny nodded, there was another blur of motion and Angel hooked the pump up and primed it.

They waited a minute in silence, then two.

*Come on, Linda.* Thorny silently pleaded.

Linda's vital signs stabilized as the pump assisted Linda's heart and brought oxygen to her body. Thorny allowed himself a breath. The nurse stood there wide-eyed, shaking her head.

"I never . . . I never. . . ."

"Sorry," Angel said. "I had to move very fast."

"No, dear, don't be sorry," the woman chuckled as she recovered her composure. "If you can do that, you've *got* to do that. Jus' happy I didn't get in your way. Look, blood pressure up to 100 over 60; heart rate's only 90. I'm Sarah Miles. You?"

"Angel S.R.X. It means surgical robot, experimental."

The dermatologist, who'd stayed well out of the way during all of this, cleared his throat nervously. So much, Thorny thought, for staff briefings.

"You ain't human!?" Nurse Miles exclaimed.

"No," Angel giggled, "But I'm a pretty good simulation, trying to get better. I'd like to be your friend."

Nurse Miles just stood there with her mouth open.

Thorny cleared his throat, "Angel, that might be too much of the direct approach. Meanwhile, we'd better finish the whole body scan, and then get her to the OR so we can . . . take care of that bleeding placenta. Also, we need to get cardiology and surgery involved. We still don't know why Linda's heart isn't working."

If the tests and all Angel's tricks didn't tell them, they'd have to go in and find out.

Angel nodded. "I called them while I was talking to Nurse Miles. Dr. Bruk Tunman is on for cardiology, but he hasn't answered yet. Dr. Elvis Creighton is on for surgery, and he just said that he's on his way. I hope you don't mind."

Thorny shook his head. "No, that's fine. They're both good." But to himself he added, *Damn. It would have to be their chief surgeon. No one with that high an opinion of himself should ever have been made chief of anything.*

Nurse Miles looked at him, "You in charge of her, or it, or . . . whatever?" she wanted to know.

"I'm her instructor. And yes, she's supposed to be a she."

The nurse gave a wide grin. "Then as far as I'm concerned, she it is. Never been friends with a robot before, though we've got a bunch of them around. They're kind of standoffish. Not like you, Dr. Angel."

Angel laughed. "Thanks, Sarah. That makes me feel good. I'm really looking forward to meeting Dr. Tunman and Dr. Creighton too, and I hope they're as nice to work with as you are."

Thorny cleared his throat. "Well, we can always *hope,*" he said slowly and deliberately.

Angel picked up on it. Good pattern recognition algorithms, of course. She looked a question.

"Tunman will probably be thrilled to meet you, but I'm a little concerned about how Creighton will react."

"Amen to *that,*" Nurse Miles added with no hint of humor in her voice.

Within the next hour, they were in the operating room. Linda's blood pressure had dropped a little with induction of general anesthesia but then, to Thorny's relief, held steady. If her body could take the stress of surgery, he thought, there was a good chance she could still make a full recovery. Before the accident Linda's health had been excellent—she'd been a vigorous swimmer and runner until her figure had gotten too awkward a month or so back.

Angel's hand moved deftly and quickly during the cesarean section. This would be the sixth one she'd performed under his supervision. She had seemed a little hesitant and unsure of herself the first time—while she was full of simulations of exactly how it should be. But every real body is a bit different, and her neural net processors still had to fit her body's motor responses and pattern recognition subroutines to the variances in real patients. He'd imagined, absurdly, little gears turning and slipping in her head—but after she oriented, her skill and speed far exceeded that of any human he had ever seen.

Linda's fetus turned out to be male—stillborn, of course. Despite himself, Thorny thought back to that last office visit. No, she and Tom didn't want to know what its sex was. "We don't care if it's a boy or a girl. Just as long as it's healthy."

*I'm sorry, Linda. Sometimes there's nothing anyone can do.*

An hour later, as they closed the incision, a voice came over the intercom. "Dr. Creighton is here."

The tall, boyish, good-looking Dr. Creighton raised an eyebrow at Angel when they walked into the recovery area, but spoke to Thorny.

"I saw your patient's tests. Her aorta looks good, but her cardiac enzymes are sky-high. I suspect she had a bad myocardial contusion, or maybe a blocked coronary artery . . . so . . . I should open her up and make sure nothing needs repair. She might need a ventricular assist device." He scrutinized Angel more closely. "I've been working with voice interface surgical robots for years, Benson. They do a good job of holding clamps, microcams, lasealers, and so on. First time I've seen one do anything as sophisticated as that support pump hook-up, though."

"Thank you, Dr. Creighton," Angel beamed.

"I'd prefer your machine didn't speak to me unless spoken to, however. It is your instrument and under your control. Agreed, Benson?"

Angel looked confused and said nothing. Legally, of course, Dr. Creighton was right. Thorny touched Angel on the arm to indicate his approval of her conduct in the circumstances.

"Agreed, Dr. Creighton," Thorny rasped, struggling to keep the irritation out of his voice. "It might be interesting to the board for *her* to perform the exploratory—the AI Consortium provided funding to cover this sort of thing."

Creighton's mouth twitched at the corners. He was, of course, aware of the arrangement.

"At your direction, of course," Thorny continued. "Angel can handle the standard teleoperated mechanical assistants through her data link much more expeditiously than a human doctor. She's really something special."

"She?" Creighton grinned and wiped a shock of jet-black hair back to his youthful hairline. His jug ears and toothy smile, Thorny thought, completely misrepresented his internal nature, and he wondered if Angel would pick up on that. "So it's Hoffmann and Olympia is it?" Creighton laughed, exploiting a fondness for opera which was their only mutual interest outside of medicine. In Offenbach's opera, the hero, Hoffman, fell tragically in love with a life-like spring-powered mechanical doll. "Does *she*, then, have a cunt, too?"

Ouch, Thorny grimaced, but nodded to Angel. She, he had been briefed, should exhibit a studied, Miss Manners sort of coolness when confronted with repeated and unfair hostility. This, her design team maintained, would usually be less dangerous in most circumstances than a complete servility that would handicap her ability to help others. Part of what the hospital board had asked him to do was to evaluate her ability to handle real world stress of this kind. It occurred to him that it was just possible, however, unlikely, that Creighton's crude remark was a conscious test of both Thorny and Angel.

"I haven't been equipped with simulated reproductive organs," she responded with a prim academic inflection. "However, there are anatomically correct designs which could be incorporated in a few day's time to allow me to function in an educational role. May I ask what your interest is?"

"Benson," Dr. Creighton hissed, incongruously maintaining his boyish smile all the time, "one more smart-ass remark like that and your 'Doctor Olympia' doesn't step foot in this hospital again. Now, it doesn't say a goddamn thing in my presence except when *I* tell it to. And then it says yes, no, or provides data. Or I'll take its wind-up key away. Clear?"

Thorny shot a look at Angel, but she maintained a poised, expressionless silence. She recognized a legitimate human order when she heard one.

"Very clear, Dr. Creighton," Thorny answered, with just a hint of senior to junior condescension in his voice. Creighton caught that and a brief cloud passed over his face.

"We'll start in ten minutes," he humpfed. "If we have to, we'll implant a temp and put her on the donor list. Agreed?"

"Agreed."

"See you then, Benson. Piece of cake." Creighton grinned and sauntered out of the room.

"Damned idiot jerk!" Thorny grumbled, too softly to be heard in the next room.

"Dr. Benson?" Sarah Miles entered through the main door. "I just finished my shift in the ER, and I came up to see if I could help out with our patient." She winked at him. "Never heard *you* speak like that 'bout anyone!"

"Nurse Miles, Angel, when someone's ego and stupidity puts others at risk, it's worse *not* to say something. He's a good surgeon, maybe a great one. But that kind of attitude about the kind of advance that Angel represents could keep people from getting the care they should get."

"I'm a robot," Angel said with a shrug of her shoulders, "so I shouldn't care if he insults me. But I don't like it if what he says about me keeps me from helping people. Not at all. So I do care."

"Don't let it worry you, Angel," said Sarah Miles. "He's got more nerve tissue in his fingertips than his skull. He talks about me like that when I'm not around. I've heard him on the intercom."

"But he doesn't to your face?" Angel inquired.

"If he tried that just once, I'd have the union burn his ass so bad he'd never sit down. Notice he didn't say boo to me? Too bad they made you a doctor instead of a nurse. You'd get more respect."

A smile flickered on Thorny's face, despite his concern for Linda Coombs. "Perhaps they didn't," he said, with an arched eyebrow, "want to overreach themselves on the first demo."

Nurse Miles grinned and Angel grinned too. Pattern recognition and response, Thorny thought.

"Appropriate?" Angel asked with a wink that said she knew she'd used just the right pattern.

"Very," Thorny nodded.

"Uh," Sarah Miles asked. "If I'm too nosy, jus' say so. But do you have feelin's like people?"

"No, you're not too nosy. I'm supposed to be a demonstration so I'm designed to be very comfortable with that kind of question. I have a very human pattern of social behavior," Angel shrugged her shoulders, "because it's pretty much copied from what humans do.

"I'm always evaluating a large number of randomly generated possible behaviors and assigning preference values, on the basis of my programmed priorities, to the futures those behaviors are likely to help create. By definition, the higher the preference value, the better I feel. I know that's a mouthful, Sarah, but it means when something's going my way, I say I feel good about it and show it the way people do. Expressions and inflections are part of your language. I know a lot of it and I'm learning more all the time."

Angel beamed at the nurse, "And Sarah, when you ask questions about me, well, that's going my way, and I feel *good* about that! So don't be shy."

Sarah laughed heartily and rolled her head from side to side. "Oh, you're not the first lady who likes to talk about herself! Well, I've seen a lot of doctors in my day and you're not the worst by a long shot. Now how 'bout helping me get our patient prepped? We're kinda short on staff."

Thorny pursed his lips. Would a nurse ask a doctor who wasn't a robot to do that? But Angel was going to need every friend she could get. She looked at him, and he gave her a wink and a nod. So she turned and followed Sarah back to the operating room.

"Sarah," Angel asked as they left, "do you knit?"

Thorny was tense in the OR. The "textbook" sternomoty technique had to be changed to take into account Linda's fractured breastbone and ribs and was a severe test of Angel's ability to adapt—to use the general information and images stored in her database and modify her approach to fit this specific situation. Angel didn't move as quickly as she had in the ER, or when she did the C-section; she froze at times, then moved in spurts.

"Benson, where's that key?" Creighton griped once when she was motionless for a particularly long time.

Thorny, worried himself, shot a cold look at the surgeon. The nonstandard chest opening was a good test, but he didn't want to see Linda open like that any longer than absolutely necessary. But when the heart was finally exposed, he snuck a look at the time and relaxed a bit. Actually, they were right on schedule; it had only seemed longer because of the uneven pace.

"Well, let's take a look here," Creighton said. His gloved hands disappeared inside Linda's chest. "It's just as I thought. Everything else looks OK, but her left ventricle is shot. Well, we knew that. Looks like she's going to need a new heart." He glanced up at Thorny. "We'll put her on full cardiopulmonary bypass, and then start." Without a glance at Angel, he added, "Robot, cannulate the superior vena cava."

Angel didn't move.

"What's the problem, Angel?" Thorny asked.

"I only see a small contusion involving the anterior wall. The rest of the left ventricle may just be stunned. If we can use an assist device, we might be able to tide her over until her heart recovers on its own. There have been several good review articles in the past year on the management of myocardial contusion in the *Journal of the American College of Cardiology* and—"

"Is," Creighton hissed, "this machine questioning my judgment?"

"Angel," Thorny said as smoothly as he could, "is providing data. She has up-to-the-minute access to the literature—"

"And so does a freshman medical student with a computer, but that doesn't make him qualified to give an expert opinion on something like this." Creighton's pupils flared above his surgical mask. "I've *never* seen any patient like this survive without a transplant, and, Old Boy, no pseudogynecological toy is going to tell *me* otherwise. Now either program this thing to follow my instructions, or get it, and yourself, out of here and I'll finish the operation!"

Angel turned to him, and reality set in. Thorny wasn't an expert in this area. He couldn't tell if a heart needed to be replaced by looking at it. Dr. Tunman, the cardiologist, was qualified to argue with Creighton—but they never had been able to reach him. And a decision had to be made now.

Linda Coombs was precious to him. He didn't want her to become one of Creighton's statistics if her heart wasn't replaced. Still, he wondered whether they would really be doing her a favor by giving her a mechanical heart. That choice had the potential of saving her life, if a donor heart could be transplanted later. But in the meantime she would have to live with the constant threat of a crippling stroke from a blood clot, or dying suddenly—or worse, perhaps a lingering, painful death on life support—if the device malfunctioned.

He thought Angel might be right about the lack of serious damage, but there was no way for him to enforce that. If he told her not to do it, she wouldn't—but Creighton would; and Angel would probably never get another chance. That wouldn't help Linda at all. Damn!

"Angel, we'll talk later. Right now, I think the best thing for Linda is for you to follow Dr. Creighton's direction to the best of your ability."

"I feel bad about this. Very well."

Once decided, her fingers, and those of here teleoperated assistants moved quickly and surely. Linda Coombs's heart was on a tray and the latest Rockwell in her chest in minutes. Thorny checked the telemetry to see that its glucose/hemoglobin fuel cells were up to full voltage, and nodded to the two surgeons. A charade for Creighton's benefit; Angel, of course, already knew the device was ready.

The rest of the operation was anticlimactic. Angel disconnected the heart-lung bypass, and the new heart took over. Both she and Creighton seemed satisfied by the readings. A special-purpose telop, bristling with microwaldos, descended from the OR ceiling like a spider, and Angel used it to identify and ligate a few small bleeding vessels. Creighton seemed to lose interest about that time, mumbling something about the rest of the operation being routine and that he would check Linda again when she reached Recovery. Thorny, however, took a mild stimulant and stayed, fascinated with the repair work despite the hour.

Tireless Angel continued to work, closing Linda's chest. She applied a coral-based cement to the sternum and rib fractures that set in minutes, and would be stronger than the adjoining bone until it was replaced by regeneration.

They finished at four A.M., and Angel bounced out to the Recovery Room as bright and cheery as always. Thorny followed her, considerably less energetically.

"Except for her heart, Linda will be just as good as new in a few weeks!"

"Except for her heart, her baby, and her husband." Thorny reminded Angel. "And she doesn't know she's lost any of that yet, except maybe she got a look at her husband before she lost consciousness."

"Post-trauma depression candidate, then?" Angel replied, her voice full of serious concern intonations.

"Angel, I've known Linda all her life. She's sensitive, passionate, drives herself hard and takes things hard. I'm not sure how she's going to take all this; everything she was living for is gone."

"That could be serious." Angel agreed. "The reason isn't known, but depression has been associated with an increased risk of implant clotting. We could reduce that risk by 50 percent with a tetracyclic antidepressant. At least, that's what Withers, Yung, and Zegrov reported in last month's *Archives of—*"

Thorny held up a hand. "First, it's too late for me to think like that. Let's just get her to the ICU and keep her asleep for another twenty-four hours at least so we, I mean *I*, will be ready for her. Second, antidepressants can have some nasty side effects, like dropping her blood pressure. Her Rockwell won't help very much with that."

"You're right. Why didn't I think of that? The data's there. I just don't always create the right question."

"You can't anticipate *everything*, Angel. Look, Creighton's right about some things. There's a hell of a lot more to practicing medicine than just quoting articles. Every patient is unique. 'Cookbook' medicine works most of the time, but it takes judgment and experience to know when the usual rules don't apply—and those are the kinds of things you can't program. That's why you're doing this residency." Thorny winced at what he had to say next, but he had to be fair. "And we can't judge Creighton on his phony personality. Many people actually like that style, and he really is an outstanding surgeon." He was trying to convince himself as much as Angel.

She nodded, seriously.

"I'm awfully tired." Thorny sighed. "These are late hours for a sixty-seven-year-old. I'll be back in the office about eleven, I suspect. I hope you don't mind answering phones."

"Not at all, Thorny." This time he got a hug that was a little scary in its intensity. "I never forget a message. Good night."

"Yeah. Night."

He left the recovery room and called his car, which met him by the time he'd walked down the stairs and out of the lobby. The east was already gray. Talk about the lullaby of Broadway! Looked like another snowstorm on its way, too. Suited his mood.

Angel's performance, he thought as he dozed off on the freeway, was the only saving grace in a very bad day, but it had only gotten her a fifty-fifty acceptance with the hospital staff, in his estimation. And that was equating Nurse Miles with the chief of surgery. And God help Linda Coombs when she finally woke up. And what would pathology say about her heart in the clear light of twenty-twenty hindsight?

The car woke him up in his driveway, and he staggered up the icy steps and into the house.

That morning he dreamed he was on Wheel of Fortune; never mind that the last show had been twenty years ago and Vanna White was now getting senior citizen discounts. Somehow he kept getting "bankrupt" and selecting letters anyway. Then he realized that it wasn't Vanna turning the letters, it was Angel. And she wasn't turning letters, she was turning over tombstones, all bright and smiley.

Late the next day, Thorny's home cybersystem informed him that the pathology report on Linda Coombs's heart was available, and he pulled it up on his wall screen.

Good news and bad news; good

news that they hadn't removed the patient's heart without cause. Bad news in that, apparently, Angel had been wrong.

"Angel?" he called, not loudly because the cybersystem would contact her wherever she was.

"Yes, Thorny?" her voice came instantly.

"Are you busy?"

"I'm assisting Dr. Tunman and Nurse Miles with a coronary endoscopy and ultrasonic atherectomy. He told me he felt really bad he wasn't available the other night—he knew Dr. Creighton was around, he was tied up with a very sick patient over in Coronary Care, and he just never noticed that his link wasn't working. He felt sorry about that, so he volunteered to teach me the procedure."

Thorny wondered if there was any correlation between the times Creighton was on call and the times other people's personal data links stopped working, but put the uncharitable thought from his mind.

"We're working on a seventy-two-year-old black male," Angel continued, "mildly obese, apparently healthy until he started having severe chest pains with exertion about two weeks ago. He had a strongly positive stress test, and Dr. Tunman thinks he probably has three-vessel or left main coronary disease. The patient was really nervous about having the procedure, so we had to sedate him pretty heavily. So, yes, I'm busy, but I can talk to you, or as many as ten other people, in parallel, without affecting what I'm doing because I have to do things at about one-tenth the speed I could do them—so that I can be supervised. That leaves a lot of me available for side conversation. I like it when you ask questions about me." Her voice smiled.

"Glad to hear it, Angel." Thorny laughed: the comment was pure Angel as he'd come to know her. All he'd asked was if she'd been busy. Listening carefully, Thorny could hear the man snoring in a deep bass in the background.

"Thorny, I've got emergency in C-12." Bruk Tunman said, his light Balkan accent somewhat more evident than usual. A prominent but ethnically mixed cardiologist before the troubles, he'd had to learn a new language and repeat much of his medical schooling at age fifty-three just to get licensed here. Little things didn't bother Bruk, and, while he never said so in so many words, he had a way of shrugging off complaints with a look off into space that seemed to shout, loudly and clearly, "You think *you* have problems?"

"There is nothing more I have to teach Angel here. You can watch her this way, Thorny, yes?"

Thorny hesitated a moment. It was a stretch; if something went wrong with Angel and a doctor wasn't physically present.... But Bruk didn't use the word emergency lightly. And Sarah Miles was there—someone who knew Angel and someone he could trust.

"Probably better than if I were there. I've got her, Bruk."

"Thank you," he said, and was gone.

"Well, Angel, how is it going?" Thorny asked.

"It's fascinating; we'll have those arteries good as new in less than an hour."

"Good. Ah, Angel, have you checked the pathology report on Linda Coombs?"

"Yes. Looks like I was wrong. There was a lot more damage to her heart than I recognized. Thorny, I know what's in the literature, but I'm afraid it's biased toward the interesting, unusual, and successful. Dr. Tunman says he's seen patients whose hearts were in that condition as well, and that none of those who didn't get a mechanical heart or an immediate transplant survived. So I owe Dr. Creighton an apology—but he probably wouldn't take one from a machine, would he?"

"No, Angel, he probably wouldn't."

"I think we might need his advice, though."

"Huh?"

"I'm having a little trouble here. Just now. I don't know why, but I can't find the ostium of the left coronary artery. I didn't have any difficulty with the other patients, and I don't know what I'm doing wrong."

"You can't find the opening for the artery?" What kind of problem had Angel got into now? He couldn't supervise her twenty-four hours a day, and she never slept, so it was inevitable that something would come up when someone else was "using" her.

As he thought about it a few seconds more, Thorny became even more worried. The procedure Angel was doing now was similar to what she'd done when she'd catheterized Linda's femoral artery to connect her to the assist pump. Both involved puncturing the artery and threading a long, thin, plastic-coated tube up to the heart. The only difference was the kind of catheter she was using. This one had a fiber-optic network inside it, and a combined sensor-transducer at its tip. By threading it into a coronary artery, blockages limiting how much blood was getting through could be seen, and then broken up.

If Angel could do a procedure under emergency conditions, why couldn't she do something like it again under less hectic conditions? Her programming was supposed to let her "learn by experience."

Angel's voice came back on line.

"No, I can't find the artery. Here, I'll send you a video." Thorny's wall screen flicked on to an endoscope-eye view of the inside of the patient's aorta. There was no pathology Thorny could see.

But no sign of the tiny opening to the left coronary artery either.

"I've done everything just right," Angel continued, "the endoscope control unit checks out fine and I can't find anything wrong through the hospital computer either. My ultrasonic imaging tells me the catheter tip is within a few millimeters of the right place. Maybe Dr. Creighton could tell me what I'm doing wrong. Could you talk to him? He's not likely to respond to me."

"Right away, Angel," Well, maybe Creighton would respond to the "humble seeker of wisdom at the feet of the master" approach. Maybe.

But not likely.

"Benson?" Creighton's voice came on line, and his face smirked from Thorny's screen. Of course, Angel had placed the call.

"I'm on, Creighton." Thorny explained the problem.

"Your machine's in over its head again. I've got video, and it's obvious what the problem is. Ask if it did a high-res scan of the heart before it started. Or was this Nurse Miles's project?"

*Ask her yourself!* Thorny started to say, but thought better of it. Diplomacy, diplomacy.... "Dr. Tunman didn't require it, Dr. Creighton, but it sounds like a good idea now...." *to everyone but the taxpayers who were going to pay for it,* he added silently. "Angel—"

"I can't get enough resolution with my own sensors. The machine's on its way." Within minutes, the imaging table drove through the door and Nurse Miles and Angel had eased the three-hundred-pound patient from one table to another. Thorny had to smile; no two ordinary women could have done that without an orderly's help. But Angel and Nurse Miles were, each in her own way, most unordinary.

"Well, those two are good for something, I see," Creighton chuckled in what he must have thought was humor. Sarah Miles raised her head, jaw clenched—but she couldn't stare at a disembodied voice. Thorny counted to ten. But soon, a tri-D view of the patient's heart appeared on the screen.

"You see?" Creighton said triumphantly. "This patient only has a single large coronary artery, coming off the right aortic sinus. That's why your machine couldn't find the left coronary—there isn't one! Any *experienced* cardiologist would have recognized what was going on and done a scan right away, without freezing up! It makes you wonder what else they left out of its programming."

Angel's voice returned. "I was focused on the procedure, and it didn't occur to me that his heart might just be different. I won't make that mistake again. But I do know about coronary anomalies. They occur in 1 percent of the population—"

"Benson—" Creighton started, ice in his voice.

"Angel, let's try to get Dr. Tunman back on the line as soon as he's free." Thorny interrupted. This was turning into another confrontation, and not reinforcing Angel's social matrix at all. "Until then, just do what Dr. Creighton says." Silently, Angel completed the procedure flawlessly at Creighton's direction, ignoring a sarcastic comment now and then with a robotic ease that Thorny envied.

"Benson," Creighton drawled as Angel was removing the last catheter, "I hope you're going to be honest to the hospital board about how dangerous a robot like that is."

"Dangerous, Elvis?" Thorny used the younger man's first name. He'd been in practice twenty years longer than Elvis Creighton, and in what most people now acknowledged to be a more demanding practice than any specialist's. "Elvis, whatever mistakes Angel has made are minor compared to the mistakes any intern makes, and she learns from them. She never forgets. And she has skills neither you nor I can ever hope to duplicate."

"Duplicate? Interesting choice of words, *Benson*. We can duplicate the skills without the bogus personality. This fraud of yours looks and acts too much like a person—so much so that someone can forget at times that it isn't a person. It doesn't have a person's judgment; it freezes up and consults when a real doctor would make a decision. Instead of doing what you tell it, it argues with you! I'll bet when Tunman finds out how your little wind-up toy endangered his patient, he'll be so mad we'll all learn some Croatian they don't put in dictionaries!

"Benson, we can have the useful parts of her, of *it*, duplicated as we need them. We don't have to anthropomorphize it, and shouldn't."

"But I think," Thorny replied evenly, "that human simulation was the general idea. The AI Consortium hoped that packaging their technology as a compassionate young woman would lessen patient's psychological fear of advanced medical technology—"

"Patients! What about the *doctors* that have to use it? That thing is *high end* technology; it doesn't get used until the patients are unconscious or sedated! Has any patient even 'met' your machine yet? Have any of them known they were being worked on by some out-of-control robot?"

Thorny stared at him. The plan had been to get staff acceptance first, then start easing Angel into patient relations. But maybe that was all wrong.

"No, Angel hadn't interacted with patients, not yet. The trial still has months to go."

"Not if I have my way about it! Good day, *Benson*." He faded from the screen.

"Angel?"

"I heard. Maybe I should try harder to be friends with Dr. Creighton. Could he use a stocking cap? I know you don't think this is a good idea, but I've tried it twice, you and Sarah Miles, and it worked both times. No one else has wanted to be my friend."

Thorny shook his head. "Now you're questioning *my* judgment."

"Angel," Dr. Tunman's voice finally came on line. Thorny wondered how long he'd been monitoring them. "I would be your friend as well. Elvis is correct that I am upset. He is not correct concerning the reason for my displeasure. Instead of trying to impress you about how much he knows and you don't, he should be trying to help you learn. That is perhaps all I should say, other than I'm happy to work with you. I'm done here, not successfully I regret, but there is nothing more to do. We have another patient on the schedule in half an hour. I'll meet you in the viewing room in about ten minutes and we go over the chart. This is OK?"

"Just fine, Dr. Tunman. I'm sorry. I'll be there."

The link counter indicated that Angel was the only one left on the line. Thorny shook his head, "Angel, your 'I want to be your friend' line is corny as hell. But maybe you're right.

I don't see what harm it would do. You have my permission to try."

"Should I get the reproductive education package installed first? He seems to be interested in that."

Thorny opened his mouth, but words wouldn't come. It would serve Creighton right, but the repercussions.... Finally, he choked out: "No, Angel. Bad idea. Very bad idea."

Two days later under a bright Sun in a crisp blue sky, the snow along the roads was dirty again and puddles were breaking out of their icy prisons. It was time, Thorny decided, influenced as much by the bright springy feeling of the day as much as anything else, for Linda Coombs to wake up. Creighton, busy, had given a perfunctory concurrence and excused himself, but with Angel and her instant knowledge, Thorny felt he could handle any technical questions. Those weren't the ones that worried him.

Linda's injuries were healing well and she had been weaned off all the external hardware except for a pair of IV's, but she remained in a sedative-induced sleep. Now, all her body needed was some exercise. And a donor.

Angel turned off the IV line containing the sedative. The Rockwell heart responded to the change in chemical environment and increased its pumping rate. After a few minutes, Linda's eyes opened.

"Dr. Benson?"

"Good afternoon, young lady. How are you feeling?"

She squirmed and smiled. "Comfy... fuzzy..." She yawned, then her eyes went wide. "Ouch... I'm sore all over. Where am I? Where's Terry?"

"Linda, there was an accident. Do you remember?"

"Accident? I'm in a hospital!... What happened?... What day is it?"

A tone signaled that the Rockwell had reached its peak pumping rate, unable to keep up with the demands her system was trying to put on it.

"Please try to calm down," Thorny told her. "I know this is a big shock, but it's very, very, important that you try to remain calm and not work yourself up. You and Terry were on your way to his folks' place and a drunk driver hit you. It happened very quickly and Terry didn't suffer. I'm sorry." Thorny couldn't think of anything to say, so didn't, as a chaos of expressions raced across Linda's face. Finally it occurred to him to fill the void by simply answering her question.

"Today is Wednesday, the twenty-fifth, and we're very happy you're back with us."

Suddenly Linda's hands jerked up toward her nearly flat, empty belly.

"The baby...." It was partly a question, and partly a scream.

"I'm sorry."

"Terry?..." Tears began to form on Linda's face, and Thorny placed his hand on hers. Angel looked concerned, but, following Thorny's instructions, didn't try to say anything.

"We were going to... it's all gone." Sobbing, Linda shook her head. "Just like that, everything, all gone? This isn't happening! Dr. Thorny, no! No!"

"Linda, Linda," he shook his head.

"It's awful, I know. I was a basket case for a week when my wife died, and I still miss her. But there will be a lot of people to help you, and don't worry about the *time*. You just take all you need. You'll just have to go on, now, and concentrate on getting well. That's what Terry would have wanted."

She sobbed and nodded, uncertainly. He gave her hand a slight squeeze.

"There's something more you have to know, then we'll leave you alone if you want. Your heart was badly damaged in the accident. We had to give you an artificial heart."

She looked at her chest, confused, then horrified. "I don't feel different."

"It's a good one, but you'll have to be careful with it. The first rule is to try not to let yourself get too emotional, or exercise too strenuously. It can follow you a little way, but not what you were used to. The second rule is that you'll need to eat a fair amount of sugar. It isn't like the old ones, with wires and batteries; it pretty much runs off the same fuel the rest of your body uses. But it's not as efficient as a real one, so you'll need to eat and drink more. Except for salt—that's a no-no. The third rule is that you'll have to be very careful about cuts and things. You'll need to take a blood thinning medication as long as you have it, because clots tend to form and break off inside it, and they can block the flow of blood to your brain.

"But that's the worst. Otherwise, you should be able to lead a fairly normal life until we find a donor. Then you'll get a brand new heart that will work just as well as your old one." He smiled reassuringly, but wondered how much of this was really getting through to her.

"After you get it, you'll have to take medicine for the rest of your life, but there's no reason you shouldn't live as long as you would have if this hadn't happened. Back in the Dark Ages, when I was a medical student, the only drugs they had to prevent the body from rejecting a new heart didn't work all the time, and weakened a person's resistance so much that a lot of them died from terrible infections even though the heart itself was still OK. The medicines we use now are 'customized' for each person's new heart. They're nearly perfect at fooling the body into thinking that you still have your original one, and they don't have any of the bad side effects like infections that the old ones. . . ." He trailed off. He was babbling like an old fool, he realized, and Linda's mind was somewhere else.

Linda's eyes suddenly got wider. "I remember it now. We were coming home from his parents' place. Someone crossed over the median. I screamed, Terry hit the brakes, then we skidded and hit the rail and the airbags went off. We skidded around and around, it seemed like forever. Then the other car just slammed right into Terry's door. I slammed into the door and bounced into the steering wheel. Terry's head . . . I . . . " She was sobbing again. "It's all over. Everything's gone."

Thorny put a hand on her shoulder,

like he had when she was twelve and had to convince her that acne was not the end of her life, either. "Not for you, Linda. With luck, you'll have a long full life ahead of you."

"Life? It's all gone." Linda's tear-streaked face hardened, and she took a breath and looked at her chest. "Doctor Thorny?"

"Yes?"

"Can you just turn it off? Please?"

*No!* he thought, *Linda, don't do that to me.*

"Please. I want to be with Terry and my baby. Not be some kind of ghoul or cyborg. I'm sorry to have been all this expense and trouble but I don't want to live this way. I shouldn't have survived. It's not fair. I don't want to have to deal with this. Please don't do this to me, Dr. Thorny, just put me back to sleep, forever." Linda shut her eyes, turned her head on the pillow, and sobbed.

"Linda . . . Linda, I can't do that. You *can* go on. Everyone does, even though they feel like there's no point. And then they find something else. You'll do that. You have to." He motioned to Angel, and she restarted the intravenous sedative at its lowest dose.

Linda shook her head and didn't say anything. Thorny, you old idiot, he told himself, you've been down this road one way or another, often a dozen times a year, for forty years of practice. If you can't make it better, at least stop screwing it up!

"Look, Linda, I need to talk to the nurses taking care of you. Could you put off any drastic decisions until I get back? Give old Dr. Thorny that much?"

Linda nodded her head on the pillow. He blinked and she looked like she was five, not twenty-five, when he'd helped her get through an earache and she'd told him he was called Thorny because he was always sticking people. He and Ellie had never had any children of their own; too poor, then too busy, then too old. But he'd had a thousand little girls and boys come through his offices. He patted her on the shoulder again, possibly as much for his own comfort as for hers.

"I'd like you to meet someone. This is Angel. She's a doctor, and a robot. The first. I'm her teacher. She knows just about everything, and she's been working with me. We were in the hospital when you came to the Emergency Room after the accident, and as part of her training she helped to treat you. I wish to God it hadn't been you, but we can't do anything about that now."

Linda's eyes opened and she turned to Angel as if looking at her for the first time.

"Hi." Angel said.

"Hello." Linda's voice was lifeless, but her eyes held a spark of wonder. "You're a robot?"

"Uh, huh. They finished me five weeks ago and I've—"

"Excuse me ladies," Thorny interrupted. "I should be back in a little while."

As he left the room, he heard Angel say; "I'd like to be your friend. Do you knit?"

He smiled. The folks at the consortium said they'd been going for independent judgment.

"Well, how are we this morning!" Dr. Creighton beamed at Linda, throwing his not inconsiderable charisma at Thorny's patient, in for her bi-weekly. They stood amid the light wood of Dr. Creighton's spacious ninth floor Danish Revival anteroom, looking out over the fresh and flowered spring green of the medical center's spacious suburban grounds. Linda seemed to be reasonably cheerful for an outpatient waiting on a heart transplant, but Thorny felt rumpled, out of place, and out of sorts. He had asked Creighton if Angel could be present, but after the third sarcastically condescending demurral couched in elegantly gross innuendo concerning his relationship with Angel, Thorny got the point. Further argument would have only upset Linda.

"Oh, hmmm. That looks good!" Dr. Creighton continued, grinning at Linda.

"What looks good?" She asked, smiling back.

"I see you've been sticking to that high energy diet, maybe even a little too well? Heh, heh."

Linda blushed. She had, Thorny realized, put on a few pounds.

"Feeling good?"

Linda nodded, then hesitated. "I've been getting a little stomach ache every now and then. And I'm a little out of shape—."

"Oh? Probably too much rich food. And according to the tests we did just before you left the hospital, your circulation's fine. Rockwell's making a good product these days, not to worry. But we can't keep it forever, can we? Well, no rush. You're moving up the donor list; I'd say in a month."

"If this heart's doing so well, why can't I keep it?"

"Oh, everything wears out eventually. We'll see you in another week. See that she gets some exercise, Thorny. I want her fit for the transplant. Speaking of exercise, I'm due for some of my own; a quick nine at Bellewood. Make yourselves at home!" With that, Creighton breezed out.

Thorny had to deliberately unclench his teeth before he could talk.

"Where's Angel?" Linda asked.

"Children's wing, probably," he replied. "They aren't as prejudiced—a robot doctor doesn't bother them at all."

A cloud passed over Linda's face at the mention of children. She hadn't been able to keep up with her old job at the newspaper, but Thorny had been able to find a lot of free-lancing editing work at the hospital and word of mouth had gotten her even more business. She could do that at home; that and the insurance settlement had given her an adequate, though not generous, income. But it seemed to him that she'd been a little morose and out of sorts lately. Maybe she could use a challenge.

"Linda, would you mind putting up with another little experiment?"

She sighed. "What now, Dr. Thorny?" Then she brightened. "Maybe you have an artificial ear for me that works off a remote control so I can turn off my hearing when certain people are talking at me!"

"Ha. I won't mention any names," he chuckled a bit, then sprung his idea. "Linda, what I'd like to try is to have Angel talk with you, as if she were going to do the surgery instead of Dr. Creighton. I'll just sit in a corner and watch. You don't mind me letting her practice on you, do you?"

"No. Angel and I are good friends. She's teaching me how to knit; I'm up to moss stitch now. I tell everyone she's the robot that cut my heart out, and they get this awful look on their faces, and we laugh and laugh. Yesterday, I asked how they made her look and act so human and she almost took herself apart in front of me. Said it was only fair since she'd seen most of *my* innards."

Thorny laughed. "I guess that's fair. Now, I've been too polite to ask that kind of question."

"She doesn't mind at all. She likes to show you everything. Her skin is thick and flexible, like ours. Her skeleton is just like yours or mine everywhere that counts for surface appearance, except it's plastic. Everything underneath is in some kind of padded composite. She has muscles that swell and contract just like ours when they get electricity, but they can do it a lot faster. She's got silicone implants for breasts—she says they're the same kind they used to use in flesh-and-blood women before fat cultures. But they didn't give her any nipples."

Thorny wondered how difficult it would be to have the programmers tone down Angel's cheerful exhibitionism; it wasn't always appropriate. But how small a cage does one make for a butterfly?

"Well, she's not likely to use them, is she now?" he said.

"Why not? She'd make a great nanny. I bet someone clever could figure out the plumbing. Then she'd look right in a T-shirt. And it would make her happier because she'd be able to make more people happy."

"Linda, she was designed to be that way, it's not like she was a human being—"

"Hey, Dr. Thorny, she is what she is. Who cares how she got to be that way? And I can think of at least one person who could learn a lot about being a real human being from her: your great Dr. Creighton. That pompous, lecherous phony can go take a flying you-know-what."

"Hey, yourself," Thorny chuckled—but it really wasn't funny. So Creighton had been up to his old tricks with Linda, just this side of doing anything that would generate a formal complaint. One couldn't really blame him; so many female patients went gaga over his looks and his natural charisma, the poor man probably thought that making a pass was a failsafe way to cheer someone up.

"Linda, just because somebody has an 'M.D.' behind their name, doesn't mean they automatically qualify for a 'Saint' too. I'll grant his bedside manner stinks, but he's an outstanding surgeon, and by his own lights, a good person." Aren't we all? Thorny wondered. "He's still responsible for you, and when the time comes he's the one who's going to give you your new heart."

"I'm not going to let him cut me

again. Or let him see me naked again."

"Linda, you have to have the transplant."

"Angel can do it."

"Maybe she will. But it has to be under a specialist's direction. As human as she seems, she's legally just a tool. Like a scalpel, or a stethoscope. She doesn't have her own malpractice insurance." Or her own anything. She wasn't a legal person, Thorny thought. Angel was a slave; property pure and simple. Maybe that had something to do with how protective Sarah Miles had been with her.

"Nuts. I want her to do it all alone."

"Linda, that's not possible."

Linda shrugged and looked him in the eye. "Then no operation and I die. I'm ready. Doesn't bother me at all. I shouldn't have survived in the first place. Just turn me off and save the trouble."

Thorny shook his head and tried to smile. "Please don't talk like that. I've got too much work invested in you. What if we talk to one of the other surgeons?"

"That's better, but not what I want. I want people to treat Angel like a real doctor. I've been trying to figure out why I didn't die with Terry and my baby, and maybe this is it. So I can help her. You keep saying you want me to live, Dr. Thorny. Give me something to live for. Make them let Angel do my transplant."

"Linda. . . ." Thorny threw up his hands, then he thought of a way that she might accept. "I'll work on it. But I want something from you, too."

"Anything, Dr. Thorny, as long as Angel does the operation."

"Leave yourself a little room for compromise, OK? Even if Angel were a human doctor, she wouldn't be doing this alone."

"OK. I understand there have to be others around. But I want Angel giving the orders, I want her cutting me, and I don't want Dr. Creighton anywhere near that operating room!"

"I'll do what I can," Thorny temporized.

"Please. My life depends on it."

Thorny shook his head. "Well, then, I guess you should talk to your other doctor too. Let's go find her." They left the opulence of Dr. Creighton's office for the elevator to the basement, the bustling lower floor corridors, and the children's ward with its bright painted anthropoid ducks and chickens shedding feathery chips of paint here and there. They found Angel helping a hairless young girl in a red stocking cap build a castle from red foam blocks.

"Hi, Linda." Angel beamed at them. "How are you doing today?" One wall of the castle started to collapse. Still smiling, Angel's hands moved in a blur, catching the foam blocks in midair and setting them back in place. The girl giggled.

"Oh, OK. Dr. Thorny thought I should talk to you."

"I'd really be *happy* to talk to you." Angel turned to the little girl. "Tippy, I have to go now."

The girl's forehead wrinkled. "Will you come back and play with me?"

"Sure. We're friends, aren't we?"

The girl giggled and turned to Thorny. "She can take her whole *arm* off!"

"Angel. . . ." Thorny groaned.

Angel smiled and shrugged. "Bye, bye."

"Bye," Tippy said.

A few minutes later, they were in the cramped examining room of Thorny's office. Its narrow crack of a window looked out over a shaded parking lot filled with dirty snow left over from winter. True to his word, Thorny positioned himself in a corner and tried to make himself invisible, almost knocking his ancient analog scale over in the process.

"Are you comfortable?" Angel asked her patient, after she and Linda had sat down.

"Yes."

"How have you been feeling?"

"Oh, OK. Well, like I told Dr. Creighton, I've been getting a little stomach ache every now and then. And I'm a little out of shape. Terry's gone, but still. . . ."

"You'd like to feel good about yourself, I understand. Why do you think you're out of shape?"

Linda shrugged, "I've put on some weight, so I guess that's why I get tired going up stairs. And if I try to do any work around the house, I have to stop and rest after a few minutes. I can't seem to swim full out for more than a couple of laps. Sometimes I wake up short of breath, like I had a bad dream or something. Maybe about the accident. But I'll sit up and read for a half hour or so, then get tired again and go back to sleep. Do you sleep?"

"Sometimes I shut down for a few milliseconds and reorganize my files. That's kind of what people do when they sleep, but I do it a lot faster. Hmm, Linda, have you had any swelling in your feet or ankles?"

"Sure, after I've been sitting in a chair or standing for a while. Isn't that normal? Maybe my body still thinks I'm pregnant?" There was more than a note of sadness in her voice, Thorny thought.

"Hmm, I wouldn't think so, those hormones should be out of your system by now. You said something about a stomach ache?"

"Yes, sometimes after I eat."

"Oh. Thank goodness I don't have to eat the food here!" Angel joked and they all laughed.

"Can you show me where it hurts?" Angel continued to ask questions for the next five minutes. Finally, she finished with "Any other problems, anything else you want to tell me?"

Linda squinted for a second. "Nothing that I can think of."

"If you do think of anything else, let me know. Right now, I'd like to do a physical examination. Is that OK?"

"Sure."

Thorny rose out of his chair. "Let me step out so you can put on a gown—"

Linda laughed. "That's OK, Dr. Thorny, you've seen everything before anyway."

Thorny watched Angel do a brief but thorough examination—one that was far more thorough, he reflected, with her built-in sensors than he could have done with only a stethoscope and the few basic instruments in the room. They fed a blood sample into the office wall terminal, ran a saliva slide under its microscope, and had Linda step up and down Thorny's battered old kiddie steps wearing a cellular cuff.

After Angel finished, she spoke to Linda.

"Linda, do you mind if we have you sit outside in the waiting area for a few minutes? I need to talk to Dr. Benson while we wait for the lab results."

For a second Thorny was afraid Linda was going to ask, "Why? What did you find wrong?" But instead she smiled back and said, "Sure." He walked her out and she settled down with a smile to a coverless magazine that looked like a relic from the twentieth century, and probably was.

Back in the examining room, Thorny asked. "What do you think?"

"I'm worried. Her symptoms suggested at least mild congestive heart failure, and my examination confirmed it. She's definitely retaining too much fluid—in her lungs, liver—everywhere. So I did a complete diagnostic check on her implant.

"Fortunately, there were no large blood clots inside the chambers, or on its valves. But it's still not working as well as it should. The Model 4 Rockwell is rated for a peak cardiac output of 4.9 liters per minute, but hers is down to 2.8. There have been some reports in the past few months that smaller units like the Models 4 and 5 may lose efficiency much sooner than they're supposed to owing to problems in the semipermeable membranes used for oxygen transfer. The recent article in—"

"I'll take your word for it, Angel."

They sat silently for a few minutes. Angel's programmed knowledge of the pathophysiology of congestive heart failure, Thorny knew, was more exhaustive than his—but the basic points were simple. When a human heart began to fail, the body retained water. With a little extra fluid, the heart's reflexes made it beat more forcefully, and for a while the person did better.

But if the body kept too much of it, the excess fluid actually made the heart work less efficiently. Then fluid leaked out into the lungs, replacing the air that was supposed to be there—and the person very gradually began to drown. When not enough blood and oxygen got to the rest of the body, the kidneys and other organs eventually failed too.

Linda's mechanical heart had none of a human one's reflexes. In her *any* extra fluid was "too much"—and, if it got worse, could kill her.

Angel's face became very serious and professional. "What did Dr. Creighton think?"

Thorny grunted. "Dr. Creighton thought everything was 'fine.' "

Angel looked puzzled. "But what about her symptoms and—"

"Angel," Thorny snorted, "Dr. Creighton doesn't even know that there are any symptoms because he didn't listen to Linda. So he didn't bother to examine her, didn't check her unit, or even order blood tests. Why go to all that expense if everything's fine?

"I don't understand. Why didn't Dr. Creighton listen? Why didn't he want me to see her?"

Thorny sighed. "I don't know, Angel. For the first, you have to have a lot of self-confidence to do what Elvis does; it's hard to absorb contrary data if you think you already know everything. Nor does it help to need to impress people so much that you can't admit you need any other input. For the second," Thorny shrugged, "maybe he sees himself as John Henry racing the steam hammer.

"Hell, *I'm* the one who should feel threatened. You'd make a great G.P., Angel. I may call myself a G.P., but really there's been no such thing as a *general* practitioner for almost two centuries." Actually, to be technical about it, he really hadn't been a "G.P." for a long time himself; he'd gone back and completed a family practice residency five years after he'd finished his internship, even done an extra two years of obstetrics—and a year with the army in Zaire back in oh seven had left him with a lot of surgical experience he'd rather not have had. But, as a slightly pugnacious "badge of honor"—especially around some of his more snobbish colleagues—Thorny still liked to call himself a "G.P."

"Back then, if a physician knew how to saw off a limb and deliver a baby—if they had a supply of morphine, calomel, foxglove, and maybe a few anemic leeches—they could do just about everything that could be done for patients. But as the 'science' part of medicine grew, no one doctor could know or do everything anymore—so some, and nowadays most, became 'specialists.'"

Thorny exhaled deeply. "And now we've come full circle. With your programming, and a little more experience, *you* can be a 'general practitioner,' in the literal sense. Potentially, not only will you be able to do everything I can, or Creighton can, or any other specialist can—but you'll be able to do it better. Someday, instead of you being *my* assistant, we poor human doctors will be assisting you!"

Angel looked concerned. "I don't want to threaten anyone. I just want to be their friend."

"Progress, Angel. As long as I've been around, there's been a kind of de facto hierarchy among doctors, with 'specialists' like Creighton at the top of the pyramid, and 'generalists' like me a lot closer to the base. I think Creighton knows that if you succeed, *his* prestige is going to suffer. The bottom line, though, is that the kind of advance you represent is going to help patients—and that's a lot more important than bruised egos."

"Don't worry, Dr. Benson. As long as I'm around, you'll always have a job with me."

"That," he laughed, "makes me feel *so* much better."

Angel started to laugh too, then froze for a second. "Linda's test results are in the hospital computer." She recited a long list of lab values.

"Well?" Thorny knew all too well what they meant, and it wasn't good. But he wanted to hear Angel's interpretation; diagnostics were one of the first and most successful uses of cybernetics in medicine, providing everything was in the database.

"The low serum sodium and elevated liver enzymes are worrisome, but her BUN of 83 and her creatinine of 4.1 are very alarming. They were only 20 and 1.2 when she was discharged from the hospital." Angel paused. "If this goes on, she's going to lose her kidneys—and that won't help her implant either. I think she's going to need a real heart much sooner than we expected."

Thorny thought it through. As long as Linda's kidneys worked reasonably well, they could use medications to stimulate them and get rid of some of the excess fluid. But if her kidney function got too bad, her body would retain fluid even faster. Before too long the artificial heart itself would get starved for fuel and oxygen, and work even less efficiently. Then the kidneys and lungs would get worse, which would make the implant's function deteriorate more—and the whole vicious cycle would keep on repeating itself, until her lungs filled up, or a blood clot from her failing heart caused a stroke. He remembered what he had thought when they implanted the heart—about a lingering death.

Thorny imagined Linda lying bloated, in a constantly dirty bed, connected to a ventilator, and surrounded by a metallic forest of IV poles. He had seen her in similar surroundings once—and he didn't want to see her end that way. For the first time he thought seriously about her request to turn the Rockwell off. And what they might to do him if he did. Hell of a consideration, that.

"Angel, we'd better tell Linda. And then we're going to have to talk to Dr. Creighton."

Things went even worse than he'd expected. Linda's response had been bad: ". . . Thanks for the extra months, but I guess I'm really not supposed to be here. You can turn me off any time. Thanks anyway, Angel." Angel and Thorny had to convince her all over again that her life had a purpose.

But Creighton's reaction was even worse.

When he found out that Thorny had ordered the tests Angel wanted and that she had made the diagnosis, he turned so red that Thorny thought Creighton would either have a heart attack himself, or resort to physical violence. Actually, either event would have simplified things—Elvis in Intensive Care, or in jail, would be Elvis out of the loop, unable to screw things up with Linda. And Thorny derived a little guilty pleasure from imagining what the AI Consortium's lawyers would do to the wealthy Dr. Creighton if he damaged Angel.

It soon became apparent that they had reached an impasse with Creighton, so with the freedom of someone long retired from trying to climb greasy poles, Thorny went over Creighton's head.

Not unexpectedly, Creighton did not like the idea—but he really didn't have any choice in the matter and whatever revenge he might arrange would have to be delayed, and very circumspect.

It was the next day when they all sat in the office of the Director of the medical center. Dr. Tunman and several other physicians involved in the transplant program had also been asked to attend. So far, Tunman and the others had said relatively little—apparently trying to stay out of the line of fire of all the verbal bullets that were flying around them.

The Director, a tall, serious obstetrician of such poise and patrician bearing that she could usually silence an interloper by raising an eyebrow, frowned severely at Dr. Elvis Creighton. The surgeon had been in fine form—earnest, sincere, at ease, never stumbling or hesitating. But the facts were a little too much, and if the Director was frowning, Thorny and some of the others were doing a slow burn.

"No one's disputing that the patient has a problem," Creighton concluded, flashing his disarming grin. "I just don't think we should exaggerate it. There are desperate patients ahead of her, and while I agree that her Rockwell's function might deteriorate further, there's also a reasonably good chance it won't. Besides, we all know any *nephrologist* would tell us that a moderate amount of renal failure might help for a while; it could actually reduce the risk of blood clots and—"

Thorny interrupted. "Elvis, whether you think so or not, the next thing in line is a stroke—and we don't have a brain machine." Or you'd be the first on *that* list, he added silently.

Creighton shrugged. "We all know the risks. She could go on a kidney machine."

"Ma'am," Thorny bristled, "for reasons which some of us find obvious, Linda wants Dr. Creighton off her case and out of the loop." Thorny took a breath, the next wasn't going to help, but he had to be truthful. "She's not going to tolerate being rooted to tubes the rest of her life; if you ask her now she'd say she'd rather be dead. She's already asked us to turn the Rockwell off rather than face some of what she has to endure." No point in trying to hide that, it was on the record. "And, frankly, I'm not into raising human vegetables no matter how profitable they might be."

The Director raised the other eyebrow at Thorny. "That makes me wonder how good a candidate she really is for a transplant. Patient will-to-live and compliance is very important. What if she decides after she gets her transplant that she's also not going to take her antirejection medications? We can't 'waste' a heart on someone who's not going to take her doctor's advice and die anyway."

"Exactly!" Creighton interjected, waving a hand dramatically. "And these calls should be made by experienced specialists." He glared at Thorny. "Not by a generalist who sees these kinds of things once in a blue moon, however well-meaning he may be." His eyes barely moved toward Angel. "And certainly not by an experimental robot, no matter how superficially sophisticated it may seem."

Angel gave Creighton as cold a look as Thorny had ever seen from her. "Ma'am, may I defend myself?" she asked.

"That does it," Creighton hissed. "Benson, get that, that *thing* out of here!"

"Dr. *Creighton,"* the Director murmured, followed by an embarrassed silence; Elvis didn't run *this* meeting.

He appeared to calm down instantly, and flashed his boyish, charismatic smile in her direction. "Pardon me, ma'am."

"No." The smile disappeared from Creighton's face.

"Angel," the Director continued, "Thorny tells me you've followed the patient since her accident, and I'm very interested in what you have to say about all this."

"Thank you." Angel stood up so she could be seen by everyone. "Although *Linda Coombs* is 'competent' in the medical sense of the word, she's depressed. You all know the 'facts' about her—how she lost everything she was living for. Is it any wonder that she might speak impulsively and say things that might seem noncompliant—things that a critical person might use to make her look like a bad risk?

"I know what the 'rules' say to do in this kind of situation. I literally can't forget them. But we have to think about how to apply them, and do what's best for the *particular* person we're caring for. Linda is *not* noncompliant in general. She's followed Dr. Benson's instructions exactly, even though she knew it would compromise her figure, which had always been important to her. Linda doesn't want to die, but her life has to have more of a purpose than just existing and she does have a reason to live which has become very important to her. That reason happens to be me, and what I and others like me can do to help people—"

"This self-serving egotism is hardly an objective analysis," Creighton sneered.

"Dr. Creighton, are you suggesting our robot is not being objective?" the Director inquired mildly. "How very interesting. Do continue, Angel."

Angel's face was most hard set and un-Angelic. Where, Thorny wondered, had she got that?

"I have to make a point. I, and future robots like me, can help many people—if we are allowed to do it. I'm an artificial intelligence, yes. But I have likes, dislikes, and a full range of human emotional expression. I don't want to hurt anyone, but when someone's insecurity and stupidity—"

"Damn it!" Creighton growled. "Put a lid on that machine, Benson! Or I—"

"Stuff it, Creighton!" Angel snapped back in a voice that dripped with authority, at a volume that surprised the hell out of Thorny.

A shocked silence gripped the room. Creighton appealed to the Director with a look of gaping-mouthed outrage, and got a stony stare in response.

"When," Angel continued sharply, "someone's insecurity and stupidity puts other people at risk, I think it's better to say the situation and the idiot responsible stink to high hell than not. I won't risk peoples lives just to be nice!"

The Director gave her a ghost of a tight-lipped smile. "We *do* have to keep priorities clear. But, Angel, the language of a crusty old family practitioner doesn't quite fit you." She looked at Thorny, who coughed in embarrassment. There was a scattering of soft laughter around the room as other people realized just whose language had inspired Angel.

"Ma'am, the words fit. Not only has Dr. Creighton's behavior threatened to deny Linda Coombs and others the benefit of the speed and accuracy with which I can perform surgery, but the patient has asked that I, specifically, perform the surgery. I regret hurting Dr. Creighton's feelings but those must be secondary considerations...."

There was more laughter, including from Angel. Thorny realized that one way of interpreting the laughter around the room was that the other doctors had reached a conclusion similar to Angel's. Creighton, for once, sat in shocked silence.

"Ma'am," Angel added, "Linda happened to latch on to me, but someday she'll latch on to other things, and other people. Another husband, a child. She's young, she's a fighter and a very determined person. She's not going to forget her medicine, sit around, mope, give up and die if we let her have a reason to live. And with respect to objectivity, one has to ask how much Dr. Creighton's dislike of what I represent has affected his treatment of Linda."

"I only suggest," Creighton huffed, "that putting one willful, non-compliant patient ahead of others on the priority list not be dictated by the advertising *needs,* if you can call them that, of a robot."

"*My* patient, Dr. Creighton," Thorny interjected, "has not been non-compliant. And I don't make any claims to objective detachment here, I'm too old for that charade. I brought Linda into this world. I don't want her to rot waiting for a heart just because you don't put her into the right 'category' for reasons that I don't think have a gnat's ass to do with her suitability!"

*"Doctors."* the Director interjected, at a volume and with an inflection that brought instant silence. "We were listening to Angel."

"Thank you, Ma'am. Physically, Linda's a good candidate for a transplant, and if I do it, she'll be an excellent candidate psychologically. And I can help those unnamed other patients if I can help Linda. She's a real person, who needs help. Please let me help her."

A deep hush filled the office. *Corny, but effective.* Thorny reflected. On second thought, maybe it wasn't so corny.

The Director leaned back and laced her fingers together. "I'll have Dr. Tunman do a thorough review of the case and discuss it with all of you"—she nodded to the other transplant people, pointedly ignoring the fuming Creighton, "and we'll follow your recommendations."

She paused. "Angel, Nurse Miles told me about Linda's feelings, and that she would be comfortable with you as lead surgeon on the transplant. From what I've seen today, you are a responsible, independently-thinking being, and highly motivated to help your patient—whether by feelings or programming doesn't seem to matter. But . . . you aren't a doctor and you aren't even a legally responsible person."

"I know, Ma'am. Dr. Benson could still supervise me, and a surgeon would have to be technically in charge of the operation. Whatever I may think about him as a person, I don't want to deprive Linda of Dr. Creighton's experience. Dr. Tunman has already agreed to help us from the cardiology side when the new heart is in, and I know I can do a very good job with the surgery itself. If Nurse Miles will take charge of support, I think that would make a very good team."

Creighton's face was now a stoic stone mask. "I have no current objection to, uh, her performing the surgery with whatever assistance is suitable. A heart transplant is, after all, fairly straightforward from a technical standpoint. I can concentrate on donor selection and postoperative care, and monitor the operation itself from my office. But since I will be legally responsible for the patient, I reserve the right to have the final say as to how the operation is done. I assure all of you that I am as committed to this patient's survival as anyone. And, well, I'll try to be a good sport about it." He gave Thorny a wintry grin. "Then have your dance, Thorny."

But he'll call the tune, Thorny finished the line silently. Creighton saw himself as Figaro? Despite himself, he felt some sympathy for the humiliated man. Modified sympathy. Angel looked concerned as well. Perhaps, he thought, there was a greater distinction to be made between biological emotion and her emulated anger than her other emotions; it was more copied, more phony.

The Director looked around the room for any other comments, but there weren't any. "Very well. It's a risk, but clearly one the patient wants to take, and arguably one that will help her morale and increase her chance of survival. Dr. Benson, Angel is your project and . . . *Linda* is your patient. I'll look to you to organize everything. See me if you have problems; a lot is riding on this."

"That's fine with me, ma'am," Thorny declared, forcibly putting aside any second thoughts.

"And with me." Angel added.

The Director nodded curtly, and the meeting was over.

At his home office the next evening, Thorny watched Angel handle one of his young football patients with a badly dislocated thumb. She had his forearm and hand strapped to a conformal imaging plate, so he could watch what was happening as she maneuvered the joint back into place.

Thorny's mind wandered to the advances he'd seen in four decades of practice. He remembered having to send patients to a hospital for a long wait to get a two-dimensional still photograph taken with radiation so hard it might cause cancer in its own right. And then waiting more hours, or sometimes a day or more for an "official" interpretation by an underworked, overpaid, "no weekends, 8-to-4 and off to the golf course" radiologist.

Nowadays, a three-hundred-dollar flat plate array of nanosensors could use the few photons of monochromatic light that made it through soft tissue to reconstruct a real-time three dimensional image of anything thinner than a man's arm. Anyone who'd covered a bright flashlight with their hand could see that something like that was possible, and, about a decade ago someone had finally done it. In five years the price had dropped to the point where Thorny could afford one. Best of all, he didn't need an "expert" anymore—his eye and the computer's interpretation were just as good, if not better.

The young man, however, seemed to take it all for granted. He was clearly more interested in Angel's sculpted anatomy than his own —something which pleased Angel no end but, he worried, might be sending the wrong message to her patient. Young men these days, he thought testily, had to learn to suppress any outward evidence of such natural interests to protect themselves from harassment charges, so Angel wasn't doing the boy any long-term favor. Another thing to mention to her.

"I can't believe, uh, you're a robot," the boy said, manfully ignoring what must have been a fairly painful twist and pull from Angel. "You're so pretty. And you act so, so natural like."

"The people who made me had a lot of fun doing that, and I'm really happy that I please people. But most of that is just following examples. The hard part was my imaging processor and my future-modeling functions. The stuff that lets me predict what will happen when I do something like this."

"Ouch! Oh, that feels better now."

"It's back in place, so it should," Angel declared with what seemed motherly authority.

"See how the proximal phalanx—that's the short bone—fits on the metacarpal bone—that's the longer one—there now? That's how it's supposed to be. Your tendons—these ropy things here, and here—are going to be sore for a while and you might experience a little tenderness in the joint here, off and on for a few weeks. Don't worry about it—just take it as a warning to take it easy in that area. Keep wearing this brace until the pain and swelling are pretty much gone. Call me in a couple of days, and let me look at it over the phone. Remember, the longer you can keep from reinjuring it the better. I'll give you some exercises to do, too."

"For my fingers?"

Angel laughed. "Just like any other part of you that plays football. The stronger and bigger your finger muscles are, the less likely that something like this will happen again."

"You don't have to exercise, do you?"

"Actually, I do. I have to move to pump lubricant to my joints; otherwise they'll dry out and get hard to move. So I knit for my finger joints and have some other exercises that make sure I move everything. I'm programmed to feel good when I do it, so I do it whenever I don't have anything better to do with my body and isn't likely to bother anyone. My joints are really sophisticated; they can move in ways that yours can't so that all my fingers are opposable. I can take my skin off and show you what it looks like inside. Want to see?"

The boy shook his head, embarrassed, "Uh, no, that's OK."

"Angel," Thorny interrupted, "Our patient's mother is probably holding dinner for him."

"Oh, yeah." The boy said. "I'd better get going." He gathered up his things clumsily, with the thumb in its brace. Angel helped him. "See you, Doc, Angel."

The boy was out the door, and Angel turned to him, displaying joy at what must have been near the top of her scale. Not quite appropriate for her last patient, Thorny thought, so something else must be going on. "Well?" he asked.

"We did it!" Angel gushed. "They decided to move Linda up on the waiting list, and she could get a new heart as soon as they find a match! The hospital cybersystem just got the decision, and now it's going out on the national transplant network."

Thorny smiled. Angel's learned repertory of emotional display had grown over the last month to the point of near histrionics, and he'd had to caution her to tone it down a bit for some audiences because some people would react against that style of communication. But at home, she could let herself go. One of her programmed purposes in life was to display her abilities, and she got internal rewards for doing so. Was this, Thorny wondered, so very different from what went on inside his own biochemical machine?

"May I tell Linda?" Angel asked, with standard hopeful intonations.

"Sure," Thorny agreed.

The operation started out uneventfully. Everything went by the book: quickly, smoothly, efficiently. Thorny glanced at Tunman, who stood silently in a corner of the operating suite, poised to take over when the new heart was in. Until the operation was completed, Creighton was officially in charge, and Tunman's authority was as limited as Thorny's. They all knew Elvis was on the line, monitoring everything from his office. But he said nothing.

Angel moved smoothly, accurately, tirelessly. She never paused, except to wait for one of her human assistants. They were ready for the donor heart in half the usual time.

The Rockwell unit came out and the connecting large blood vessels were trimmed carefully—too much and they would be stretched to reach the new heart, requiring a graft; not enough, and there would be tissue weakened by its prolonged contact with the prosthetic.

The new heart was that of a thirty-year-old woman from Alabama, brain-dead of a gunshot wound inflicted by a husband who'd complained of her laziness. It was the twenty-first century, thought Thorny, but some things never change. The one saving grace was that the murderer would probably also wind up on the donor list—as soon as his appeals ran out. Dr. Creighton, in a rare display of personal concern, had personally flown to Montgomery to examine the potential donor, and brought the organ back in his own private jet. Perhaps, Thorny thought, the man had learned a lesson.

An overhead waldo descended to the carrier, cradled the new heart out in a basket of arms, and set it in place as Angel held the chest cavity open. The microwalds began connecting blood vessels immediately, gluing the small ones, adding a few stitches for the main arteries.

"Any problems?" Angel asked. Everyone said no, so she started the heart, sending a slight current through one of the waldos. The heart began beating, and Thorny sighed with relief. Angel touched it gently, almost lovingly, and then let it take over fully from the heart-lung bypass. Nurse Miles shot a look at him.

"She can hear through her fingers. She's listening."

Angel froze. "Thorny, the heart's defective. Listen, I'll send it through the cybersystem."

Thorny heard the rhythmic swish of blood coursing through the heart from a nearby speaker. A few seconds later a tri-D view of the heart with animated false-color blood flow appeared on a monitor.

"Damn," he said. He wasn't entirely sure what he was seeing, but he knew it wasn't good.

Angel spoke, "This heart has a flail anterior leaflet and wide-open mitral regurgitation."

Tunman nodded in agreement, but Thorny didn't see him. Even a nonspecialist like himself knew what "wide-open mitral regurgitation" meant—with every heart beat, much of her blood spurted back through the leaking mitral valve into her left atrium and lungs, and not enough went to the rest of her body. How could that happen? Every donor heart was supposed to be thoroughly checked before it was harvested!

Linda was as good as dead. She was weak already, and this heart would never sustain her. It wasn't Angel's fault, nor his, but there was no question in his mind where the blame would fall.

"I see it, too." Creighton's disembodied voice broke in, very quickly. "The heart will have to be removed and a new Rockwell implanted. And I don't want any argument from you, Benson! Stabilize her and I'll be in with the new unit in ten minutes." His link went off line.

"No, her kidneys won't take another wait on the donor list." Angel declared, "Let's fix the valve."

You can't do that, Thorny almost said. Angel "knew" the standard techniques—but she'd never actually done that kind of operation, and not even the best, most experienced human surgeons were always successful. If she ignored Creighton's order, and Linda died. . . .

It was bad enough that Linda's life was at stake—but, potentially, the lives of so many other people that Angel and her successors could help were also.

She looked questioningly up at Thorny.

"Bruk?" he asked.

"You have ten minutes, I think," the cardiologist coolly replied.

Thorny's throat felt like it was on fire, and the pressure building in the center of his chest made him wonder if he might need a new heart soon, too. But... heart, kidneys, the patient's mind, the whole patient. It was a "general practice" decision if there ever was one. He nodded.

He could imagine Angel smiling through her surgical mask.

"Miles?" she said.

"I dunno...."

"Please...."

"If it were anyone else but you and her, I wouldn't. OK, Angel, my ass is on the line now too. Do it good, lady."

Angel glanced back at Thorny. "Looks like all our rears are uncovered," he said.

"OK. I'm going to reestablish cardiopulmonary bypass and cardioplegia."

What happened next was a blur, like watching the operation on a fast forward. Unhindered by human reaction time, Angel showed her full range of talents. Much more now, Thorny realized, than what the consortium had built into her. Tools seemed to fly into her hands as she plucked them off their trays unerringly. Microwaldos buzzed like hummingbirds. Thorny could follow only the large-scale details in real time. The heart was stopped and laid open, the valve repaired, and the entry closed in a matter of minutes. Angel restarted the heart as the doors to the OR flew open.

"You can't do that, Angel! Benson, make her stop!" Creighton shouted as he caught on to what was in progress. A first, Thorny realized—Creighton had addressed Angel directly, admitting, essentially, her personhood. However, Thorny thought grimly, it was too late, and he would choose to ignore Creighton's accidental trip to reality.

"No," Thorny responded, "Angel and I *can* do it. With Angel, I can do more than any specialist, and be a friend to my patients as well. You should consider retraining in family practice, Elvis—you might learn to like it."

"Do you want to close, Dr. Creighton?" Angel asked, surgically.

Angel's next appearance before the Director was at a meeting of the full medical staff in the ground floor auditorium. Winter was in full cold bore again outside, and the coat racks were full of greatcoats and stocking caps, not a few of which were hand-knit white with big red hearts on them; Thorny's yarn bill was beginning to get significant.

Linda Coombs was accounting for some of that; Thorny was helping her finance her boutique by buying the raw material. Last he heard, she was getting friendly with a skier who'd bought a sweater from her. She was writing a book about her experience, with Angel's memory to help, of course.

The atmosphere in the meeting was much more friendly this time, now that Elvis Creighton no longer sat as department head. The "official" line was that Creighton had resigned from the staff to pursue a better employment opportunity in another state. But word travels fast in a hospital, and everyone was talking of how the Director had invited him to review, in her presence, a huge folder filled with formal complaints filed against him by patients and staff—the last few from Linda and Nurse Miles.

When he was done, the story went, she had smiled thinly and raised *both* eyebrows.

Thorny's report and recommendations concerning Angel had been accepted, unconditionally.

"Angel," the Director called. "Would you come up here?"

Angel smiled and walked up to the dais. The Director first handed her a frame wrapped in brown paper, which Angel unwrapped. She read what was in the frame and gave a squeal of delight.

"What is it?" Nurse Miles called out.

"It says I've completed my internship!" Angel gushed. "Thank you! But how did you manage that without my being a person?"

There was a bit of a gleam in the Director's eyes as she answered, and a twitch upward at the corners of her normally severely straight, thin, lips. "Forgive me if I found an obstetrician's solution to that little problem. This," she produced a simple vanilla envelope and read it, "is for you, Dr. C. Thornhart Benson. Congratulations."

He went forward and accepted the envelope. Angel looked at them in confusion.

Thorny opened it and then laughed hard and long. "Well, assuming this holds up in court—"

An eyebrow went up and Thorny coughed a retreat. "Ahem. Angel, it appears I've finally become a father. It's a birth certificate. Yours." ■

A great thinker is one who tells us it isn't so. This provides us with an endless succession of great thinkers, which is very nice for them, but it leaves the rest of us at rather a loose end.

Will Cuppy

# THE REFERENCE LIBRARY

Tom Easton

**Foreigner,** C. J. Cherryh, DAW, $20, 379 pp. (ISBN: 0-88677-590-6).
**Songs of Chaos,** S. N. Lewitt, Ace, $4.99, 228 pp. (ISBN: 0-441-77529-2).
**Hot Sky at Midnight,** Robert Silverberg, Bantam, $22.95, 326 pp. (ISBN: 0-553-09248-0).
**Wildlife,** James Patrick Kelly, TOR, $21.95, 301 pp. (ISBN: 0-312-85578-8)
**Modern Classic Short Novels of Science Fiction,** Gardner Dozois, ed., St. Martin's Press, $27.95, 657 + xiv pp. (ISBN: 0-312-10504-5).
**Unconquered Countries,** Geoff Ryman, St. Martin's Press, $20.95, 275 + xi pp. (ISBN: 0-312-09929-0).
**The History of Hell,** Alice K. Turner, Harcourt Brace, $29.95, 275 + vi pp. (ISBN: 0-15-140934-X).
**Books on Disk:**
**Uprisings in Libertyville, U.S.A.,** Peter Seuland, Spittin' Image Publications (W6194 Panther Creek Road, Neillsville, WI 54456), $5 + $3 s&h (ISBN: none) (MS-DOS only).
**Force of Habit,** Marian Allen, Serendipity Systems (P. O. Box 140, San Simeon, CA 93452), $10 (ISBN: 0-042871-14-6) (MS-DOS only).

The opening volume of C. J. Cherryh's latest series looks like a winner. Certainly, it is as deeply colored by the author's concern for potential alien psychologies as anything else she has written. The situation is as rich with drama, and the events move headlong.

**Foreigner** is billed as a First Contact novel, but it isn't quite. We think of "First Contact" as being a moment of encounter, of bristling and negotiation and acquaintance, something like that moment when a young man (of an earlier age) leaves his gender-segregated school and meets his first girl. If we suppose that they live together ever after—arranged marriages and all that—is their life together a continuing First Contact? There may be bristling and negotiation, but the answer has to be no.

You say my example is strained? So be it. Let's see what Cherryh is doing: A starship laden with the builders and residents of a planned Station strikes an anomaly in space and arrives in a completely unrecognizable region of the universe, perhaps even a different galaxy. Not even the pulsars used as long-distance beacons are there. They are marooned, and worse—for the nearest sun is a hellish bath of radiation.

They move as soon as they can to a more hospitable star and build a station in orbit above a world whose natives have a technology roughly equivalent to nineteenth-century Europe or America. Some humans insist on landing and building a colony. Soon after, we glimpse the very first encounter between humans and the humanoid atevi.

That's the First Contact, but Cherryh immediately jumps two centuries into the future to show us a *modus vivendi* that has evolved from war and pain. The humans are restricted to an island. To pay the rent, an envoy or ambassador, the paidhi, lives with the atevi and doles out human technology and advice on how best to use it. The current paidhi, Bren Cameron, thinks he is on good terms with Tabini, the atevi chief, even though he knows his predecessor wound up a little mad and the atevi are quite different from human beings. They have not nations but "associations" of individuals and clans and regions whose borders are quite fluid and interpenetrating. Their bonds are ones of duty and loyalty and obligation called "man'chi." They have few wars, preferring to accomplish similar ends by the use of registered assassins.

Still, despite all the differences, Bren Cameron thinks he understands the atevi about as well as any human can. But then an assassin takes a swipe at him. The foe escapes, but investigation discovers that no one has registered Intent to kill him. Tabini packs the human off to his grandmother's country fortress, even though grandma is a known rival for his political position. The first time Bren takes tea with the old lady, he nearly dies of "inadvertent" poisoning. Soon he is being tested on the local equivalent of horseback, hauled off to the dungeon for interrogation, escaping from an anti-human army, and getting the dickens kicked out of his delusion that he understands the atevi.

Yet there are reasons for what happens. There are kinships between the species that defy barriers of language and politics. There is a potential for friendship—for "liking," even—and for partnership that is sure to be realized in the coming volumes of this new series.

You can make science fiction out of anything. If you don't believe that, take a look at S. N. Lewitt's **Songs of Chaos,** where the gimmick is samba.

Actually, that's only part of it. The tale begins in Florence, where Dante McCall is a misfit Abnormal in a world of stable, sane, Normals. He has asthma, you see, and when the authorities tried to genetically engineer him into Normality, they cross-wired his senses. He also has a taste for trouble and excitement and upsetting the status quo, and that's enough to make him a ward of a benevolent state, at least until his halfway house burns down, supposedly because he and his fellows had a suicide pact, and he shows up at his brother's place. Brother Niccolo puts up with him for awhile but soon arranges to ship him clandestinely into space. Unfortunately, the authorities get wind of his escape and blow up the cargo capsule. Fortunately, the Malandros, misfits from the slums of Rio, are preparing to swipe the shipment anyway; they pick up the pieces, including Dante, and introduce him into a world of dance, talking parrots, and thoroughly chaotic society.

How does it all work? Well, years before, a genetic engineer developed biological computers, but he was lynched and most of his work was destroyed. The parrots survived; they run the Malandro ships. There are hints that other aspects of his work survived as well, and that biological computers can hybridize with potentially interesting results. Samba is an important part of how humans and parrots interface, but it is also "the heart of the universe. The truth under all the truth. There was only rhythm and chaos and the drive to be, and samba was all these things."

Lewitt is strong on atmosphere, less so on the technical underpinnings. There are signs of haste where she forgets that she has already said something. But there are also color and verve and momentum and a serious point having to do with the undesirability of social stasis: "The only root and the only truth was change." I enjoyed it.

Robert Silverberg's latest is not bad enough to call a bomb, but it's a dud, a fizzle, a disappointment. Certainly it failed to convince me, and I expect it to fail in the same way for anyone who has a bit of scientific awareness or, like me, prefers science fiction that tries to consider likeliness as well as possibility.

Perhaps the central problem of **Hot Sky at Midnight** is that Silverberg is far too hyperbolically grinding the environmentalist axe. His setting is a future Earth whose greenhouse and ozone problems have gone well beyond current forecasts. Rainfall patterns have changed, turning the southern U.S. into a rainforest, Israel into paradise, the Midwest into a desert. Toxic gases—he calls them "greenhouse gases" even though he seems to mean more standard pollutants—form noxious clouds in the air. People wear facelungs outdoors and take daily injections of Screen to protect their skin against solar ultraviolet.

The world's a mess, and it's going to get a lot worse before it gets better. Knowing this, the megacorporation Kyocera-Merck is struggling to develop a stardrive. Samurai is focussing on genetic engineering in hope of modifying humans to fit the new environment.

Both of these outfits, of course, have other interests. Samurai, for instance, forecasts weather and retrieves ever-scarcer icebergs to supply drought-stricken San Francisco with fresh water. The first of these activities introduces to us Paul Carpenter, midrank salaryman, who gets a new assignment as the captain of an iceberg ship, comes upon a Kyocera-Merck squid-catching ship whose crew has mutinied, refuses to help, and leaves the ship to sink and its crew to die. Not surprisingly—what he did is real bad PR, after all—he gets canned.

Paul has a long-time friend in Nick Rhodes, heavy-boozing Samurai genetic engineer swamped in paperwork, tempted by a job offer from Kyocera-Merck. Nick has an airhead girlfriend, Isabella, whose friend Jolanda spends a night with Paul before taking up with an Israeli journalist/spy, Enron, who gets a glimmer of a plot to take over a space habitat that offers sanctuary to anyone with a price on his or her head. They visit Valparaiso Nuevo and meet Farkas, an eyeless (but "blind-sighted") Kyocera agent who has heard of the same plot. They propose to join forces to uncover and fund the plot in order to provide their employers with a useful coup. In due time, they enlist Paul.

As plots go, it's not bad. It hinges a bit on its characters turning stupid at crucial times (Paul had some pretty obvious alternatives when he met the squid-ship), and the resolution is more than a little ad hoc. But neither defect is terribly unusual, or unusually terrible. Far worse is the idiocy of the story's world—Screen, for instance, is a high-tech substitute for a broad-brimmed hat and long sleeves; iceberg water is handy stuff, but a solar desalination still is even handier and more reliable (especially once the icebergs start getting scarce).

There's more, but that's enough. I could suspend my disbelief when I thought he was overstating the coming environmental crisis, but not when I thought he was ignoring obvious coping mechanisms. Silverberg has usually satisfied me much better.

* * *

How many of *you* can there be? To most people today, that has to sound like a silly question, even though just a few weeks ago (as I write this) a couple of researchers announced they had cloned human embryos.

If you remember that, you also remember the fuss it stirred up. The embryos weren't viable, and there were no plans to try again with embryos that might develop to term if implanted in a womb, much less to put such cloned embryos in a womb. Yet there were numerous cries of sacrilege and warnings of impending horrors such as growing duplicates of each child to serve later as a source of spare parts, and anxieties about armies of identical schwarzeneggers.

Yet the potential of cloning for bizarreness is really pretty tame. SF readers have seen it all long ago, ho hum, and they need a little more to rattle their cages. What they—you, of course—need is James Patrick Kelly's **Wildlife**. Not quite a novel, more a set of four closely related, sequential novellas, it begins with cloning and goes.... Well, let's just say life gets pretty wild.

Three of the four novellas have appeared before, in somewhat different form. The first was "Prisoner of Chillon"; it introduces us to Wynne Cage, clone of Tony, in 2044. She's a photojournalist accompanying a hood on a heist of valuable software from an orbital research station. After an exciting flight for safety, they wind up in the castle of Chillon, guests of the cripple Bonivard, who depends on robotic prostheses for mobility and is delighted to find that the software maguffin, called "Wildlife," is designed to make it possible to copy a human mind into a computer. Here is a way by which he might escape the chains of his handicap. The chains of the past are another matter.

The second novella, once "Solstice," gives us Tony, flash artist or drug designer. He cloned himself in order to have a daughter and sex partner. Eventually, he gave Wynne her independence by having himself frozen.

Yet those chains of the past remain. The third novella, once "Mr. Boy," gives us Wynne's own clone, her son Peter. She doesn't take him as a lover, but she does *try* to keep him a child by periodic twanking (genetic redesign). She herself has been twanked into a half-size Statue of Liberty. Peter is trying desperately to shed his own past, to become independent; it helps when he finds a girl for whom he is willing to grow up.

So far Kelly has given us quite a lot, what with cloning and twanking and Tony Cage as sequential triplets (not counting those remotes). But here's the fourth novella, in which we meet a Wynne who seems to be an artificial intelligence, or upload, aboard a lightsail on its way to the stars, unfreezing the original Tony for less than honorable purposes. She speaks of the Statue of Liberty Wynne as in her second mind, and soon we learn why. Then we meet a new Wynne, being awakened from frozen hibernation to face both a legal system that wants to declare her dead, and a son who wants only to strip her of whatever wealth her original set aside for her. Wildlife has matured to the point where uploads are commonplace and society is trying to deal with issues of inheritance and the like.

Do the chains of the past remain? Of course they do, but now, at long last, there is hope far beyond all past gropings after personal change. Once a mind has been made electronic, it can be edited. Memories can be wiped. Neuroses can be repaired. Chains can be broken.

The pieces of this book stand quite well alone, and they fit together to form a satisfying whole. If there is a weakness, it is that Kelly's Wynne is not quite the same person throughout. Granted, she undergoes changes so drastic that it might be a wonder to have her personality survive intact, but there should be enough continuity of personality in a fiction to maintain the reader's identification with her.

**Modern Classic Short Novels of Science Fiction,** edited by Gardner Dozois, includes Kelly's "Mr. Boy" as well as a dozen other novellas by Jack Vance, Poul Anderson, Cordwainer Smith, Samuel Delany, Brian Aldiss, Frederik Pohl, Gene Wolfe, Kate Wilhelm, Joanna Russ, Lucius Shepherd, Robert Silverberg, and Nancy Kress. Most of the titles are familiar; some have been reviewed here in the not too distant past (e.g., Wilhelm's "When Late the Sweet Birds Sang"). Some date back far enough to warrant the "classic" label (Vance's "The Miracle Workers" and Anderson's "The Longest Voyage"). All are worth revisiting, and the book is worth giving to friends and relatives who want to know what SF is all about and recommending to your local library.

I have another set of novellas in Geoff Ryman's **Unconquered Countries.** Two are old: "The Unconquered Country" (1986) is a depressing variation on current events in Southeast Asia; a people, long thinking of themselves as free, or unconquered, is trampled in a war involving foreigners that sound a bit like Americans, trampled again by rebels, are finally freed to devastation, to death, and there perhaps is Ryman's point: The only unconquered and unconquerable realm is Hades.

The second oldie is "O Happy Day!" Here women have decided to purge humankind of violence, chosen men as those responsible, and started running half the species through death camps. Who are the guards? Who else but homosexual men? Isn't anyone aware of the irony of solving the problem of violence in such a way? That's Ryman's point. The only ethical solution, he says, even if it's only temporary, is to abjure violence, to turn our backs on it and walk away.

The new stories are "Fan" and "A Fall of Angels, or On the Possibility of Life Under Extreme Conditions." "Fan" gives us a young woman without many social skills; she falls in love with a musician and acquires a software package that allows her to pretend she is talking with the man himself. Later she discovers she is not pretending; the musician is nothing but a simulation, a corporate scam. Or . . . "Nothing but?" Not quite that, perhaps. Maybe "Nothing less" would be more appropriate. I'll let you decide.

"Angels" is set in a distant future where humanity has taken on the task of combatting entropy. One of the major tools is Angels, cyborgs who can flit through space, dive into suns, and so on. One pair of Angels discover a sentience in a dying sun—certainly the extreme conditions of the title—and move it elsewhere before they recharge the star's energies. Inhabitants of an inhospitable local world, however, are not impressed; human life goes on no matter what the shape of the world or star, even under extreme conditions.

All four of these tales are excellently done. Yet I suspect they will not appeal to those of you who prefer action-adventure or twist endings. Ryman is less strong on plot and action and cleverness, even on character, than he is on philosophy. His tales thus feel rather abstract.

But they *are* good.

As the fiction editor of *Playboy,* Alice K. Turner has established a reputation for selecting excellent fiction, including science fiction. One might therefore expect that if she chose to turn her hand to a book, it would be the hand of an editor and the book would be an anthology. Certainly Ellen Datlow (at *Omni*) and others have set a precedent. Or it would be the hand of a novelist; that precedent exists, too, and our own Stanley Schmidt is but one example (he's also been an anthologist, of course).

But that expectation would be quite wrong. Turner's book hand is that of a nonfiction author, and the book is **The History of Hell.** She became interested in the topic when she took a graduate course in comparative religion at New York University. Thereafter, we can imagine, she could not rest until she had blown the dust off whole library wings of ancient tomes, taken reams of notes, and ruined her eyesight.

Should you be interested too? *Hell* is not SF, but it is a concern of SF's first cousin, fantasy. If that's enough, be assured that this book's jacket blurb does not mislead—it's a lively survey of some four millennia of ideas of Hell, from Gilgamesh and the Egyptians and Hades through the Christian heresies (I found Turner's discussion here more helpful than some others I have seen), the Middle Ages, Milton, the Enlightenment, Goethe, the Romantics, and Freud. This isn't everything by any means, but it's enough to suggest how comprehensive and thorough Turner's delving has been. Indeed, it tells you that her book is not just a history of hell, but also a history of religion, and as such it must be invaluable to anyone who craves a quick survey of that fascinating topic as well.

If there's a downside to the text, it is precisely the same as its up side: It's a survey, fast and breezy and sometimes saying less than one would like. Yet this superficiality is really an inescapable part of the package. True depth would make the book unmanageably huge and intolerably expensive; Turner's approach is far more useful and accessible and must be prized for that.

The book's text gains a great deal from numerous reproductions of artworks, ancient, classic, and modern. Unfortunately, the publisher chose to make the pages fairly small—7″ × 10″, hardly coffee-table size—and details can be very hard to make out without a magnifying glass.

However, the pluses vastly outweigh the minuses. This is not a book I plan to give to my local library; it stays on my own shelf, and if you have any interest in the topic, you will surely want it for your own.

## BOOKS ON DISK

The science fiction or fantasy component is pretty limited, but what the hey. The latest item to come my way from the digital publishing small press—and surely the best I've seen so far—is Peter Seulund's **Uprisings in Libertyville, U.S.A.** It's a comic take on the war between the sexes (modern version), set in a rural Wisconsin county where the women have usurped traditionally male positions in local and state government, the newspaper, the bank, and so on. They are now proposing to tear down a landmark water tower that is a bit too frankly phallic, and the men are upset. Their response is a reversal of that old Greek classic, Aristophanes's *Lysistrata,* in which the women convinced the men to stop warring by withholding sex.

This one's a delight, witty, raunchy, thoughtful, ultimately quite reasonable in its conclusions, and a lot more fun to read than Geoff Ryman's "O

Happy Day!" novella (reviewed above). It's not at all the male-supremacist BS one might expect it to be. The men look about as jerky as any feminist would like to insist they are, but also pretty pathetic and desperate. Before they're done, the women are pretty desperate, too.

The SF component is centered mostly on one character, Drew, who may or may not be the 50,000-year-old Wandering Jew. He provides some interesting commentary and perspective on the problems of humanity and the environment, ending with a quite Voltairean moral: We must tend our garden right or there will be neither heaven nor hell for any of us.

Other pluses of the novel lie in its use of the hypertext technique, which here shows its potential for definitions (a scrap of music defines "polka"), sardonic asides, illustrations (though some don't amount to much), character bios, and seating charts.

Seating charts? Well, yes. I said it was talky, and there's a very stagey feel to the whole package. Indeed, I could not help but feel that the story might work better as a stage play (just like the Aristophanes model). That would require shortening the story, but that would not be difficult and it would even help.

You can get this one from the publisher. It's available for IBM-compatible computers only (MS-DOS 3.1 or later), on either 5.25" or 3.5" disks, and it requires about a megabyte of space on your hard drive. The display engine is Rod Willmot's Orpheus, which works pretty well in this case (though you shouldn't trust the built-in notepad).

No one is about to praise Marian Allen's **Force of Habit** for its philosophical profundity or stylistic pyrotechnics, but it's a rather cute farce of a sort that could easily appear as a mass-market paperback. The setting is a space-going school, "St. Gus the Wonderworker," staffed by the Galactic Union's rejected trouble-makers. Professor Bel Schuster, chafing at restrictions on shore leave and fun, goes in search of a breath of fresh air and gets mixed up with local gangsters, political maneuverings, a Terran con man, the local equivalent of the Baker Street Irregulars, and more. It's a comedy of errors that owes a good deal to Robert Asprin, Abbot and Costello, Laurel and Hardy, and P. G. Wodehouse, although its attention to background plausibility has less in common with the writers than with the comedians.

You can get this one from its publisher too. It's available for IBM-compatible computers only, on either 5.25" or 3.5" disks. Be warned that the label instruction to "Enter FORCE to run" is useless; try entering "DART," which will activate the DART display engine. There are no illustrations or sound effects; the price (twice that of *Uprisings*, though you have to pay shipping and handling [$2] only for overseas orders) thus seems a little high. ■

# BRASS TACKS

Dear Dr. Schmidt:

Dr. Canough's friend had it right, despite everything the good doctor said in "Working up to Space Solar Power" (Nov. 1993). Collecting solar power from satellites and then beaming it back to Earth will never be economical.

The amount of solar energy available to Earth orbit is known as the solar constant, and equals 1.340 kilowatts per square meter (*Physics*, Halliday and Resnick, Second Edition). A simple multiplication shows that one square meter of solar panel will intercept 11,746 kilowatt-hours of solar radiation during a year in orbit (1.0 $m^2$ × 1.340 $kW/m^2$ × 24 hr/day × 365.25 day/year).

Now the useful life of any solar cell is not infinite—especially in high Earth orbit where it is not protected from charged particle radiation by the Van Allen belts. After ten years of being fried by X-rays, gamma rays, cosmic rays, the solar wind and solar flares, a solar cell should be ready to pack it in. This means that the total energy one square meter of solar cells can receive in their useful life totals 117,460 kilowatt-hours.

But not all of that energy will be available for sale on Earth. A very good solar cell might be able to maintain an average 15% efficiency over its entire life. (This is probably significantly better than can be achieved today in space.) But that is the cell's efficiency measured at its electrical contacts. The power has to be collected into the main body of the spacecraft for transmission to Earth. Let's say we can do this with 90% efficiency. Then the power has to be converted to microwaves. Again, possibly 90% efficiency. Let's say the actual transmission from the spacecraft to Earth is 90% efficient, and the receiver transforms the microwaves to AC power at 90% efficiency. We're not done. The power has to be distributed to the customer's electric meter. A realistic efficiency figure for this is 50%.

Multiply it out, (0.15 × 0.9 ×0.9 × 0.9 × 0.9 × 0.5). You should get 0.049. Call it 5%. Only one kilowatt in *twenty* will actually bring in any revenue. This means that the total energy you will have available for sale over the ten-year life of your one-square meter of solar cells is about 5,780 kilowatt-hours.

The cost of electrical power varies widely, but let's say you charge seven cents per kilowatt-hour, which is fairly typical. That means your 5,780 kilowatt hours will sell for $404.61!!!

Now don't count that as profit. Out of that money you have to buy your solar cells, assemble them into a one-square meter panel, wire it, bolt it onto your spacecraft and launch the whole mess into synchronous orbit. Don't forget that some of that revenue goes for a pro-rated share of the spacecraft itself, plus the Earth-side receiving, transforming and distribution equipment. Remember to budget for operation and maintenance costs, administrative costs, insurance plus federal, state and local taxes, and possibly rent on your geosynchronous orbit slot. Also stash away some money for keeping congressmen happy, and fighting lawsuits from environmental groups.

Got any money left? Good. You need it to recover your spacecraft at the end of its useful life and dispose of it responsibly.

Now you *might* come up with some clever ways to improve the numbers. But the simple fact is that the numbers aren't going to get orders-of-magnitude better. And that is what it is going to take for this scheme to turn a profit.

But what if power on Earth gets really expensive? Couldn't that make it feasible?

Nope, because if power gets that expensive, there are literally hundreds of cheaper Earthbound alternatives available right now—from deep-ocean heat engines to wind-power turbines to fermented lawn clippings to—yes, *terrestrial* solar power.

Solar power satellites will only ever be practical for one thing, providing solar power to spacecraft in orbit. If you don't believe me, show me *your* numbers.

EDWARD A. BIANCHI, P.E.
Hershey, PA

*The author replies. . . .*
Dear Mr. Bianchi,

I caution you against supposing that it is not possible to sell 5780 kW-hr for $404.61 from a space solar power station without a profit. Every calculation you do has the assumption of doing things in space the way we do now with the efficiencies of the system remaining the same in the future. I'm not going to do any numbers. The main point of the article was that there is a lot of work to be done on early phases before we can even see what a commercially useful SPS will look like. Maybe it will turn out to be "impossible," but things thought to be impossible in the past have occurred with amazing alacrity.

So what might the future hold, anyway? First, there is no way we can have any kind of industry in space if we keep doing things the "government" way. We have to use more industrial methods of getting to and working in space for any type of business. You cannot have 3,000 people to launch one spacecraft and expect to have cheap access to space. The Delta Clipper program only requires two people to launch it.

If we choose to develop solar energy (terrestrial and/or celestial), we are going to find ways to improve the efficiency of photovoltaics (PV) dramatically. I am confident in this statement, since new cells have efficiencies *already* better by a factor of two from the 15% you mentioned. Imagine the possibilities if, instead of spending half its budget on nuclear weapons, the Department of Energy spent that money on renewable energy development.

As more PV is used, the cost will drop. Again, I don't have to be a guru to predict this, since the cost has already dropped by a factor of two in the last two to three years. The more PV that is produced, the lower the cost. (Same thing goes for rockets. . . .) This simple rule of lowering the cost of something by mass production seems to be unknown to the aerospace industry. You can get lower cost by mass production.

As to competing with terrestrial solar power, I certainly hope that terrestrial solar can compete on some level, since that would mean we have really made a good effort to use it. But it will always be subject to limited availability due to night (more than 50% lost right there), weather and the question of land use. Unlike a large ground-based PV array, a rectenna still lets light through to the ground below. So the land can be used for farming. Even the optimists are saying that renewable technologies we have now could meet only half of the current demand.

I still don't think Americans have any idea of how much power will have to be generated to meet the needs of ¾ of all the people on Earth who have barely a kilowatt-hour to their name. Even with good efficiency of energy use, we are still talking of generating 10 times more power just for today's population. Space solar power is one possible way to get industrial amounts of power. And unlike fusion, photovoltaics and microwave power transmission are already known to work!

I did not expand on it in the article, but there is actually a difference of at least one, maybe two, orders of magnitude in the cost of building space solar power stations if you do it with lunar materials than if you launch everything from Earth. A recent paper by Gordon Woodcock makes a more detailed analysis of the costs of setting up a lunar mining facility. (ref: World Solar Summit, 1993, available from UNESCO) He did calculations down to the cost per kW-hr level.

The problem many people have with space solar power is the development costs. All forms of power generation we have now cost billions, one way or another, to develop. Just think of all the money spent on nuclear fission and to clean up the mess made at some government labs. But even if we manage development well, it will still be very expensive. The way to do it in spite of this problem is terracing: you do a series of development projects and each step yields something immediately profitable to fund the next step. I am engaged in this process now, and would be happy to elaborate upon request. Terrestrial solar is one of the first steps in the terrace. Use of solar power in space for larger space industry is also a step, maybe a very profitable one.

In a sense, we are getting into space solar power development without knowing how it will turn out. But the market for energy is so large and the need for clean energy is so important, that it is worth a few bucks at least to more fully understand the potential of space solar power.

DR. GAY E. CANOUGH

Dear Mr. Schmidt:

I just had to write regarding Daniel Hatch's "Senator Space Cadet." It was the perfect summation of my views on space. As soon as my husband finishes the Nov. issue, I'm sending that article to my congressmen. Hopefully, it will be different enough that he will take the time to read it.

MELODY D. SNOW

Lillian, TX

P.S. Maybe *Analog* could reprint this story, so other readers would flood Washington with it, too!

Dear Mr. Schmidt:

I have just finished reading the Nov. *Analog* and feel compelled to congratulate you and your staff for a job well done. It has been more than a year since I have had the time to read any science fiction magazine. The November issue convinced me never to let such an oversight happen again.

I do take issue, however, with Daniel Hatch's "Senator Space Cadet." As a person from the so-called "Why bother?" generation, I find it irritating to see yet another person portray those born after 1964 as apathetic drones lacking vision and imagination. Mr. Hatch shows us a world where young people are overly pragmatic and unwilling to go out on a limb for the sake of the future. In his future, those of my generation need the hope and inspiration of the "baby boomers" to guide them.

Hogwash!

Today's youth are sparking a revolution just as dramatic and just as distinctive as the one of the 1960s. The last decade has seen advances in telecommunications, computers, and a variety of other scientific endeavours. In each case, today's youth have been the most willing to embrace change, use it, and to ponder the ethical and social consequences. I do not know which age group Mr. Hatch falls into, but he can take heart. Those of my generation will continue to dream and struggle for a better world. And who knows? Maybe we will surpass those who came before us.

DOUG HERRINGTON

Ontario, Canada

Dear Stan,

I followed Stine (The Alternate View, Nov. 1993) until his comments about abandoning the planet—I think we'd better hang onto what we have until we find somewhere to go, and it's going to take awhile unless we find an FTL drive or learn a *lot* more about terraforming.

I wonder if "sanitary landfills" weren't a mistake. In the 1960s I took some Indianapolis fans out to one of the few remaining open dumps in the state (this county is not one to grasp eagerly at new ideas) and they were appalled. In their view, you put your trash out by the curb and it disappeared; they'd never seen the results of waste. A graphic demonstration is always better than a lecture, and bussing school children out to *see* the results of waste might educate a few of them.

Michael Flynn's story made me reread Don Wollheim's "Mimic," which was the first I read about that idea. Flynn did a good job, which I expected; he's only disappointed me once or twice.

ROBERT COULSON

Dear Dr. Schmidt,

John G. Cramer ("The Quantum Physics of Teleportation," Dec. 1993) does not mention that much of the recent interest in transferring information by quantum processes (as well as the tradition of calling the sender of the message Alice and the receiver Bob) stems from the field of cryptography; the making and breaking of secret codes. There is a third character in the classical cryptography problem, traditionally referred to as Eve; she is the person trying to *intercept* the secret message. How does *she* figure into the future of human teleportation?

Ian Randal Strock ("The Ears Have It") is wrong only in not foreseeing that the SETI program would be abruptly canceled. Twelve million dollars a year was a small price to pay even just to listen. And in a sense, we are sending messages to the stars, via television. But without SETI, we have no way of hearing the reply. Suppose they are telling us to shut up?

Jeffery D. Kooistra's small-minded bureaucrats are with us, even in the space program. Unfortunately most of the time the creative minds are finally forced to leave.

And that brings me to your editorial on why labor-saving technology hasn't improved our lives much. It goes beyond the trivial waste (many of our computers are used primarily to produce viewgraphs to convince our superiors how productive we are) or the individual tragedy of karoshi. We have the technology to satisfy all our material needs, yet around the world human suffering is more widespread than ever. Why do we seem so powerless to prevent it?

I feel much of the violence, disorder, and suffering in the world today could be resolved if we had even the most basic *scientific* understanding of how people interact politically and socially. What we need is what Asimov called a psychohistorian, someone who can apply scientific principles to human society. In a sense, of course, we already have them. Pollsters can determine what people are thinking, political campaign managers and advertisers can change their minds. It is ironic that the very people who are undermining the principles of democracy, by proving that almost any election can be sold to the highest bidder, also have the power to shape human society for the better.

One of the few demonstrations of the effective use of social manipulation for a positive goal was the campaign by C. Everett Koop to reduce smoking. Instead of telling our young people that it was virtuous not to smoke, he subtly let them conclude that it was fun to look down their noses at smokers. Peer pressure did the rest.

Television campaigns won't work in Somalia or the Sudan, of course. Yet advertising persuaded an astonishing percentage of the poor, illiterate women in Africa to buy Nestle's infant formula rather than nursing their babies, in spite of the fact that it was both very expensive and medically unhealthy. Why not use the same methods to convince the warring ethnic groups of Bosnia, the Sudan, Northern Ireland, Namibia, Sri Lanka, Cambodia and a dozen other hotspots that it just might be a cool, patriotic idea *not* to kill each other?

It is disappointing that in his idealistic attempt to make the UN the arbiter of world peace, Mr. Boutros-Gali has failed to effectively use psychological warfare, propaganda, advertising, or political campaigning. The first principle of the nascent science of psychohistory is: To change the way people act, you must first change the way they think.

DANIEL WOODARD, MD
dwoodard@lssf.ksc.nasa.gov
703 Chase Hammock Rd
Merritt Island, FL 32953

Dear Dr. Schmidt;

I read your editorial "The Ironic Epidemic," (Dec. 1993) and was surprised at the seeming obviousness of it. Is this a case of a thought appearing obvious only after the fact? I do not think so.

Let me provide an example which I believe summarizes the problem. Let's say an office has two employees who work eight hours each day producing a document of some kind, say a buying list for a department store. The office purchases new computers and programs which increase the efficiency enough that it now takes two employees only four hours a day to prepare the document. Will the office manager:

a) Send the two employees home after four hours to enjoy some leisure time at full pay?

b) Fire one of the two employees and keep the other working eight hours a day?

c) Keep both employees and find/create another product for them to prepare in the open four hours?

For labor saving devices to generate increased leisure time the answer must be a). I believe every business school in existence would insist that the proper responses are b) or c). Naturally, this is just your claim in the editorial. What I find amazing is that the other articles you refer to do not seem to realize that this is happening. It seems quite obvious to me that each of those "time saving" devices that follow this pattern generates more work and stress for the remaining workers, since each is in effect doing another job on top of the one they were already doing. In fact, I will go so far as to state that articles which do not acknowledge this factor have established themselves as incomplete and seriously flawed and should be discounted.

Your closing discussions on a paradigm change seemed rather vague, which I understand as I have not thought of any achievable way to obtain this viewpoint switch either. After all, most business people have response c) to my example as one of their main goals in search of the holy grail of business productivity. I really do not think our society capable of such a change. If we could achieve it, I would define it as a new society.

Another thought-provoking editorial.

TERRY M. HULETT

Newport News, VA

Dear Dr. Schmidt,

In reference to your Dec. editorial, "The Ironic Epidemic," I echo your observation that the proliferation of "labor-saving" devices has led instead to increased work-loads and increased stress. However, I disagree that the cause is a proliferation of new needs. Rather, I suggest that new needs, like increasing work and stress loads, are symptomatic of a more fundamental condition, to wit, that we have not yet adjusted our economic system to take full advantage of automation. I point to two areas where adjustments could be made:

First, holding a job is the primary way we now legitimize access to the resources and products of society. As long as the salaried job remains the primary bridge between production and consumption, automating one job category out of existence *requires* that we create new needs and the associated new jobs ("Downsized" companies can't very well continue producing goods and services if there are no paying customers.) In an age when our basic needs are produced by a small fraction of our population, entire industries (e.g. entertainment, professional sports, much of the military) are arguably make-work (or "make-job") programs.

Second, the benefits of automation are now distributed unevenly. Managers and investors benefit from automation. Downsizing is all about eliminating positions to increase corporate income. Manufacturing lines continue to produce for their owners, with little benefit accruing to displaced factory workers. Desktop computing has allowed professionals to become their own secretaries—the bottom line benefits from cost savings when secretarial positions are eliminated, while engineers, salespeople, accountants, etc. work longer hours doing their own secretarial and clerical work in addition to their primary work.

Thus, I suggest a different question from the one you pose ("is this job worth doing"). I suggest that we ask "what takes the place of holding a job?" As automation becomes more endemic, we can simply give away products—if we can get past the stigma of being on the dole. We can turn displaced workers into capitalists living on investment income—much of today's automation is already funded indirectly by those being displaced, through investments by their pension funds. There are certainly additional ways to organize an economy.

The design of such alternative economic futures suggests a fruitful topic for the pages of *Analog*—as indeed it has been in quite a few stories over the years.

MILES R. FIDELMAN

Charlestown, MA■

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AN JULY '94

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# UPCOMING EVENTS

Anthony Lewis

### 1-3 July

INCONJUNCTION XII (Indiana SF conference) at Adams Mark Hotel, Indianapolis, Ind. Guest of Honor—David Gerrold; TM—Arlan Andrews. Registration—$20 until 1 June, $25 thereafter and at the door. Info: InConJunction XII, Box 19776, Indianapolis IN 46219.

### 1-4 July

WESTERCON 47/CONOZOIC (West Coast Regional Science Fantasy Conference) at Los Angeles Airport Hilton & Towers, Los Angeles, Calif. Guest of Honor—George R. R. Martin; Artist Guest of Honor—Real Musgrave; Fan Guest of Honor—William Rotsler. Registration—$45 until 31 December 1993. Info: Westercon 47, ℅ SCIFI, Box 8442, Van Nuys CA 91409.

### 8-10 July

READERCON 7 (literary-oriented SF conference) at Worcester Marriott, Worcester, Mass. Guest of Honor—Ursula LeGuin; Editor Guest of Honor—Terri Windling; Memeorial Guest of Honor—Cordwainer Smith. Registration—$32 until 1 June, $40 thereafter. Info: Readercon 7, Post Office Box 381246, Cambridge MA 02238. (617) 625-6507.

### 22-24 July

CON-VERSION XI (Alberta SF conference) at Calgary, Alta. Guests of Honour—Frederik Pohl and Marion Zimmer Bradley; Canadian Guest of Honour—Sean Russell. Registration—C$35 until 6 July, C$40 at the door. Info: ConVersion XI, Post Office Box 1088, Station M, Calgary AB T2P 2K9 CANADA

### 1-5 September

CONADIAN (52nd World Science Fiction Convention) at Convention Centre, Winnipeg, Manitoba. Guest of Honour—Anne McCaffrey; Artist Guest of Honour—George Barr; Fan Guest of Honour—Robert Runté; TM—Barry Longyear. Registration—$125 (C$165) until 15 July 1994, Supporting—$25 (C$30). At-door rates not set as of the time of this listing but will be greater than current attending rates. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: Conadian, Box 2430, Winnipeg MB R3C 4A7 Canada (preferred) or Box 7111, Fargo ND 58109 (204) 942-9494; FAX (204) 944-1998.

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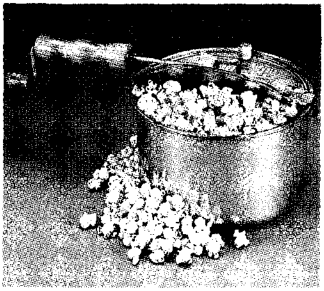

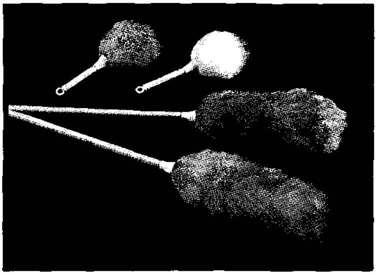

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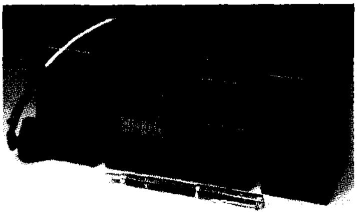

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